123 Main Street
White Plains, New York 10601
914 681 6200

New York Power Authority

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JPN-91-013

U. S. Nuclear Regulatory Commission
ATTN.: Document Control Desk
Mail Stop P1-137
Washington, D.C. 20555

SUBJECT: James A. FitzPatrick Nuclear Power Plant
Docket No. 50-333
Generic Letter 89-10, Supplement 3, Item 2
HPCI, RCIC, and RWCU MOVs

References:

1. NRC Generic Letter 89-10, Supplement 3, "Consideration of the Results of NRC -sponsored Tests of Motor-Operated Valves," J. Partlow to all Licensees, dated October 25, 1990.

2. NYPA letter, J. C. Brons to NRC, "Generic Letter 89-10, Supplement 3," dated December 13,1990 (JPN-90-074).

Dear Sir:

This letter is the Authority's response to Reporting Requirement 2 of Generic Letter 89-10, Supplement 3 (Reference 1).

The Authority has evaluated the motor - operated valves (MOVs) which perform a containment isolation function in the steam supply lines to the High Pressure Coolant Injection (HPCI) and Reactor Core Isolation Cooling (RCIC) turbines and the supply line to the Reactor Water Cleanup (RWCU) system pumps. Attachment 1 details the results of the evaluation.

The actuators for these MOVs were selected using an effective coefficient of friction between the valve disc and seat (valve disc factor) of 0.2. Current test results, for valves of a design different from those at the FitzPatrick plant, suggest that 0.2 is lower than that which exists during high energy line break (HELB) conditions. The NRC's concern is that if the valves were designed with disc factors which are too low, the actuators would not be able to operate the valves under the maximum flow caused by a double ended guillotine HELB. Although the test results may not be applicable to the valves installed at the FitzPatrick plant, the Authority has implemented short term corrective actions and is evaluating long term solutions to this problem. The Authority has reviewed the current torque switch settings for the affected valves. Only one valve actuator torque switch required adjustment because it was below the manufacturer's design maximum setting. Setting the torque switches to the manufacturer's design maximum, optimizes the capabilities of the valves while maintains adequate protection for both the motors and the actuators. The Authority will make a final decision on long term corrective actions when blowdown tests are completed on valves identical to those installed in the FitzPatrick plant.

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As was discussed in Reference 2, no significant safety concern exists at the FitzPatrick plant as a result of this issue, because leak detection instrumentation would close these valves before a complete break could occur. The valves would, therefore, not need to close under high flow rate or high differential pressure conditions.

The Authority will have a detailed MOV program description available at the FitzPatrick plant before shutdown for the refueling outage currently scheduled to begin in October 1991.

If you have any questions, please contact Mr. J. A. Gray, Jr.

Very truly yours,

Ralph E. Beedle
Executive Vice President
Nuclear Generation

STATE OF NEW YORK
COUNTY OF WESTCHESTER

Subscribed and sworn to before me this 17th day of April, 1991

Mina Holden
Notary Public

MINA HOLDEN
NOTARY PUBLIC, State of New York
Westchester County
No. 4829150
My Commission Expires Aug. 31, 1991

Office of the Resident Inspector
U. S. Nuclear Regulatory Commission
Post Office Box 136
Lycoming, New York 13090

Regional Administrator
U. S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, Pennsylvania 19400

Brian C. McCabe
Project Directorate 1-1
Division of Reactor Projects 1/11
U. S. Nuclear Regulatory Commission
Main Stop 14 B2
Washington, D. C. 20555

NEW YORK POWER AUTHORITY
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
ASSESSMENT OF THE HPCI, RCIC, AND RWCU MOVS
IN RESPONSE TO NRC GENERIC LETTER 89-10 SUPPLEMENT 3

BACKGROUND

Generic Letter 89-10 Supplement 3, Reporting Requirement 2 requests submittal of the criteria used to determine whether deficiencies exist in containment isolation valves in the steam supply lines to the High Pressure Coolant Injection (HPCI) and Reactor Core Isolation Cooling (RCIC) pump turbines and in the supply line for the Reactor Water Cleanup (RWCU) system. At the FitzPatrick plant, these valves are:

	INBOARD	OUTBOARD	BYPASS
HPCI:	23MOV-15	23MOV-16	23MOV-60
RCIC:	13MOV-15	13MOV-16	
RWCU:	12MOV-15	12MOV-18	12MOV-80

The design bases for the HPCI, RCIC, and RWCU systems include consideration of potential high-energy line breaks (HELBs) outside of primary containment and the need to isolate the ruptured piping system. The Authority performed the FitzPatrick plant HELB evaluation in accordance with the guidance contained in Reference 1.

APPLICABILITY OF INEL TEST RESULTS TO HPCI, RCIC, AND RWCU ISOLATION MOVs

The NRC - sponsored blowdown tests performed by the Idaho National Engineering Laboratory (INEL) tested MOVs typically used in boiling water reactors for HPCI, RCIC, and RWCU containment isolation. The MOVs tested were flexible wedge gate valves of various sizes and manufacturers. The results of the tests, presented in NRC Information Notice 90-40 (Reference 2), indicate the thrust required to close the flexible wedge gate valves was typically higher than predicted by industry standard sizing calculations.

None of the MOVs used at the FitzPatrick plant to isolate HPCI, RCIC, and RWCU are of the flexible wedge design. The HPCI outboard bypass valve, 23MOV-60, is a 1" Y-type globe valve. The remaining seven MOVs are parallel disc gate valves manufactured by Anchor/Darling (A/D). All of the MOVs use Limitorque actuators. Only six of eight containment isolation valves in these systems have an active function for HELB mitigation.

Although there is no direct correlation between the INEL test results and the isolation capability of the HPCI, RCIC, and RWCU isolation valves installed at the FitzPatrick plant, the Authority will use the two stage approach outlined in Supplement 1 to NRC Generic Letter (GL) 89-10 (Reference 3) to prioritize GL 89-10 program implementation for these valves. In addition, the Authority is a member of the BWROG Committee on GL 89-10 Issues and is following the recent correspondence between the BWROG and the NRC on the subject of valve mispositioning (Reference 4) as it relates to the FitzPatrick plant.

HELB CONSIDERATIONS

Six MOVs perform active safety functions for HPCI, RCIC, and RWCU HELB mitigation. The original maximum allowable torque switch settings for those valves were determined using

industry standard methodology and design parameters. That methodology uses the pull-out efficiency of the motor/actuator and the design valve disc factor of 0.2 (parallel disc gate valves).

The Authority is continuing review of the design bases of the affected valves. This review is concentrated in two areas:

1. The inherent conservatism in the design parameters versus more realistic HELB conditions, and

2. The feasibility of using the run efficiency of the motor/actuator for determining maximum allowable torque switch settings for the open-to-close stroke of the valves.

Using HELB conditions provides margins to the original, conservative, design parameters. The pull-out efficiency is related to the closed-to-open stroke of the valve, and using this factor to calculate valve closure capability is conservative. The Authority has performed parametric calculations at the following conditions:

Case 1 - using design parameters and the pull-out efficiency of the motor/actuator,

Case 2 - using HELB parameters and the pull-out efficiency of the motor/actuator,

Case 3 - using HELB parameters and the run efficiency of the motor/actuator.

The results of the parametric calculation are shown in Tables 1, 2, and 3.

HPCI HELB

In the normal standby configuration, the inboard valve (23MOV-15) is open and the outboard valve (23MOV-16) is closed. A one inch bypass around the outboard valve maintains the HPCI steamline hot and pressurized up to the steam admission valve to the turbine. An isolation valve, 23MOV-60, is provided in the bypass line around 23MOV-16.

The design basis HELB for the HPCI system is a rupture of the steam supply line downstream of 23M0V-16 when the system is in the standby mode. Under those conditions, break flow is effectively limited by the one inch bypass (23MOV-60) and redundant isolation capability is provided by 23MOV-15. Automatic isolation is initiated by the local (ambient air) temperature detectors and the high-flow instrumentation (<300%). A comparison of the original design conditions versus the HELB conditions as they relate to MOV capability is provided in Table 1.

RCIC HELB

In the standby mode, both the inboard (13MOV-15) and outboard (13MOV-16) isolation valves are normally open. The design basis HELB is a rupture of the steam supply line downstream of 13MOV-16. Redundant isolation for the HELB event is provided by 13MOV-15 and 16. Automatic isolation is initiated by the local (ambient air) temperature detectors and the high-flow instrumentation (300%).

A comparison of the original design and the HELB conditions as they relate to MOV operability for 13MOV-15 and 16 is shown in Table 2. As was the case for the HPCI MOVs, the HELB conditions were taken to be 1045 psig line and differential pressure, with 100% voltage available.

RWCU HELB

The RWCU system is normally in service with both the inboard (12MOV-15) and outboard (12MOV-18) isolation valves open. The one inch bypass valve around the outboard isolation valve, 12MOV-80, is normally closed and is not an isolation valve for purposes of HELB mitigation. The design basis HELB is a rupture of the RWCU piping downstream of 12MOV-18. Automatic isolation is initiated by local ambient air temperature detectors. Redundant isolation is provided by 12MOV-15 and 12MOV-18.

A comparison of the original design and the HELB conditions as they relate to MOV operability for 12MOV-15 and 18 is provided in Table 3.

NON-HELB OPERABILITY CONSIDERATIONS

For non-HELB conditions, containment isolation operability is ensured, because little flow or differential pressure exists during valve closure. This is because pump and turbine trips coincide with the isolation signal, and flow is largely stopped prior to any significant valve loading. The one exception to this is an "A" logic subsystem HPCI isolation. Isolation signals from the "B" train of the HPCI isolation logic initiate closure of the turbine stop valve, 23HOV-1, and closure of 23MOV-60 and 16. The "A" train isolation logic initiates closure of 23MOV-15 but does not result in a direct turbine trip. An indirect trip would occur due to low steam supply pressure as 23MOV-15 approached the closed position. This would occur against the HPCI turbine steam flow demand which is much less challenging than HELB conditions.

The HPCI outboard containment isolation valve (23MOV-16) must open for HPCI initiation. Operability for the opening of 23MOV-16 is ensured, because little or no differential pressure exists since the open bypass valve (23MOV-60) pressurizes the HPCI supply line.

CORRECTIVE ACTION

SHORT TERM

The short-term stage of the Authority's effort focused on torque switch settings for the identified MOVs. The Authority has reviewed the current torque switch settings for the six valves of concern. All are presently set at the actuator manufacturer's design maximum setting. This setup maximizes the capabilities of the installed equipment and maintains adequate protection for both the motors and actuators. Using these torque switch settings, the actuators will be able to close the valves under HELB conditions for calculated disc factors from 0.29 to 0.80.

MEDIUM TERM

Maximum torque switch settings determined using run efficiency in place of pull-out efficiency will be evaluated. If determined acceptable, torque switches will be reset to these values and diagnostic testing will be performed to verify performance.

Modification F1-90-197 will replace the actuator and certain valve components for 13MOV-16. This modification will upgrade 13MOV-16. It will also address a previously identified deficiency (Reference 5) in the design full stroke time requirement.

LONG TERM

The longer term portion of the Authority's GL 89-10 program as it relates to RCIC, HPCI, and RWCU MOVs will be to assess Anchor/Darling (A/D) blowdown test results when they become available and factor the results into the GL 89-10 program. The Authority will consider additional modifications to upgrade these MOVs contingent upon the results of the A/D planned test program. This test program will determine the appropriate valve disc factor for the A/D parallel double disc gate valve design under HELB isolation conditions. The A/D test program will be open to review by interested and qualified third parties such as EPRI, the NRC, or the MOV Users Group (MUG). This is necessary to ensure that valid test results are obtained and that they will satisfy NRC concerns.

If the A/D test results demonstrate that the planned medium-term corrective actions are inadequate, the Authority will evaluate replacing the installed MOVs with improved design valves. This is based on the fact that it may be impractical to adapt resized actuators to many of the existing valves. The valve body would not be able to withstand seismic and thrust forces associated with such large actuators.

SCHEDULE FOR CORRECTIVE ACTIONS

Short term corrective action is complete.

Medium term corrective action is scheduled for completion during the 1991 Refueling Outage scheduled to begin in October 1991. If modification F1-90-197 is not completed as presently scheduled, then torque switch setting changes will be made (if determined acceptable) to the current 13MOV-16 as well as to the other valves of concern.

Because of the schedule for the A/D test program and the lead time for the manufacture of replacement valve component and actuators, it is not possible to complete the long term corrective action until the Fall 1993 refueling outage.

SUMMARY

The torque switches for the HPCI, RCIC, and RWCU MOVs have been set to the manufacturer's recommended maximum setting. This will maximize the available thrust/torque consistent with maintaining adequate protection of the actuator and motor. The increased torque switch settings result in higher effective valve disc factors (at the maximum torque switch setting) and provide additional assurance of valve isolation capability under HELB conditions. For the six valves of interest, present calculated effective valve disc factors for HELB conditions are between 0.29 and 0.80 (globe valve excluded).

The Authority's long-term effort will reflect the results of the A/D test program specific to parallel disc gate valves and resolution of the valve mispositioning issue. The Authority will give priority to evaluating HPCI, RCIC, and RWCU MOVs used for HELB mitigation.

REFERENCES

(1) NRC letter, A. Giambuso, to applicants and licenses, "General Information Required for Consideration of the Effects of a Piping System Break Outside Containment" (Appendix B to Branch Technical Position ASB 3-1), dated December 1972.

(2) NRC Information Notice 90-40, "Results of NRC - Sponsored Testing of Motor - Operated Valves," dated June 5, 1990.

(3) NRC Generic Letter 89-10 Supplement 1, "Results of Public Workshops," dated June 13, 1990.

(4) BWROG letter dated March 14, 1991, G. J. Beck to T. E. Murley, "BWR Owners' Group Design Basis Assumptions for BWR MOV Evaluations Under Generic Letter 89-10."

(5) NYPA, PORC Meeting Minutes, dated June 27,1990.

TABLE 1

NEW YORK POWER AUTHORITY
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
EVALUATION OF THE HPCI ISOLATION MOV CAPABILITY
DURING POSTULATED HELBS

	23MOV-15		23MOV-60		23MOV-16 (3)	
	DESIGN	HELB	DESIGN	HELB	DESIGN	HELB
PARAMETER						
line pressure (psig)(1)	1,250	1045	1300	1045	1250	1045
differential pressure across the valve (psid)(1)	1,250	1045	1300	1045	1250	1045
voltage (% of nominal)	± 10	± 10	84(2)	100	84(2)	100
pull-out efficiency	0.45	0.45	0.4	0.4	0.4	0.4
run efficiency	N/A	0.6	N/A	0.5	N/A	0.5
Maximum effective valve disc factor/ current (vendor) maximum TSS	0.28/1.75	0.35/1.75	3.10/1.00	4.00/1.00	0.21/1.75	0.26/1.75
Maximum effective valve disc factor/ maximum TSS (pullout)	N/A	0.35/1.75	N/A	4.84/1.25	N/A	0.35/2.00
Maximum effective valve disc factor/maximum TSS (run)	N/A	0.56/2.25	N/A	5.96/1.50	N/A	0.42/2.25

NOTES

(1) The design line and differential pressures conservatively exceed actual operating conditions. Normal reactor pressure is approximately 1000 psig. The high pressure reactor trip setpoint, 1045 psig, was used to conservatively bound system pressure in the standby mode.

(2) The DC MOV motors were designed to operate at a reduced voltage of 105 VDC, or 84% of nominal bus voltage. The 105 V DC limit was based on the results of the station battery design duty cycle calculations and effectively considered the available voltage two hours after a dusign basis loss-of-coolant accident concurrent with a loss of bnttery charging capability. Under HELB conditions, nominal DC voltage would be available to affect line isolation.

(3) Valve 23MOV-16 is normally closed. Therefore, this evaluation of closing under HELB conditions is not required. Data presented is for information concerning capabilities beyond FitzPatrick plant HELB requirements.

TABLE 2

NEW YORK POWER AUTHORITY
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
EVALUATION OF THE RCIC ISOLATION MOV CAPABILITY
DURING POSTULATED HELBS

	13MOV-15		13MOV-16	
	DESIGN	HELB	DESIGN	HELB
PARAMETER				
line pressure (psig)(1)	1,420	1045	1420	1045
differential pressure across the valve (psid)(1)	1,250	1045	1250	1045
voltage (% of nominal)	± 10	± 10	84(2)	100
pull-out efficiency	0.4	0.4	0.4	0.4
run efficiency	N/A	0.5	N/A	0.5
Maximum effective valve disc factor/ current (vendor) maximum TSS	0.38/1.25	0.49/1.25	0.65/2.50	0.80/2.50
Maximum effective valve factor/ maximum TSS (pull-out)	N/A	0.49/1.25	N/A	0.96/3.00
Maximum effective valve factor/ maximum TSS (run)	N/A	0.64/1.75	N/A	0.96/3.00

NOTES

(1) The design line and differential pressures conservatively exceed actual operating conditions. Normal reactor pressure is approximately 1000 psig. The high pressure reactor trip setpoint, 1045 psig, was used to conservatively bound system pressure in the standby mode.

(2) The DC MOV motors were designed to operate at a reduced voltage of 105 VDC, or 84% of nominal bus voltage. The 105 V DC limit was based on the results of the station battery design duty cycle calculations and effectively considered the available voltage two hours after a design basis loss-of-coolant accident concurrent with a loss of battery charging capability. Under HELB conditions, nominal DC voltage would be available to affect line isolation.

TABLE 3

NEW YORK POWER AUTHORITY
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
EVALUATION OF THE RWCU ISOLATION MOV CAPABILITY
DURING POSTULATED HELBS

PARAMETER	12MOV-15 DESIGN	12MOV-15 HELB	12MOV-18 DESIGN	12MOV-18 HELB
line pressure (psig)(1)	1750	1045	1750	1045
differential pressure across the valve (psid)(1)	1020	1045	1020	1045
voltage (% of nominal)	± 10	± 10	84(2)	100
pull-out efficiency	0.4	0.4	0.4	0.4
run efficiency	N/A	0.5	N/A	0.5
Maximum effective valve factor/current (vendor) maximum TSS	0.24/1.75	0.29/1.75	0.33/2.50	0.3[illegible]/2.50
Maximum effective valve factor/ maximum TSS (pull-out)	N/A	0.29/1.75	N/A	0.43/3.00
Maximum effective valve factor/ maximum TSS (run)	N/A	0.40/2.75	N/A	0.43/3.00

NOTES

(1) The design line and differential pressures conservatively exceed actual operating conditions. Normal reactor pressure is approximately 1000 psig. The high pressure reactor trip setpoint, 1045 psig, was used to conservatively bound system pressure in the standby mode.

(2) The DC MOV motors were designed to operate at a reduced voltage of 105 VDC, or 84% of nominal bus voltage. The 105 V DC limit was based on the results of the station battery design duty cycle calculations and effectively considered the available voltage two hours after a design basis loss-of-coolant accident concurrent with a loss of battery charging capability. Under HELB conditions, nominal DC voltage would be available to affect line isolation.