U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report Nos. 50-220/88-24
50-410/88-26

Docket Nos. 50-220
50-410

License Nos. DPR-63
NPF-69

Licensee: Niagara Mohawk Power Corporation
301 Plainfield Road
Syracuse, New York 13212

Facility Name: Nine Mile Point Nuclear Station, Units 1&2

Inspection At: Scriba, New York

Inspection Conducted: July 25-29, 1988

Inspectors: Thomas Koshy, Senior Reactor Engineer — 9/7/88 date
PSS, Engineering Branch, DRS

Roy K. Mathew, Reactor Engineer — 9/7/88 date
PSS, Engineering Branch, DRS

Approved by: C. J. Anderson, Chief, — 9/8/88 date
PSS, Engineering Branch, DRS

Inspection Summary: Inspection on July 25-29, 1988 (Inspection Report Numbers 50-220/88-24 and 50-410/88-26)

Areas Inspected: Special announced inspection to review the corrective actions that resulted from IE Bulletin 85-03 that addressed improper limit switch and torque switch settings in motor operated valves. This inspection reviewed the engineering and maintenance activities to assure the operational readiness of the motor operated valves.

Results: The licensee has addressed all the significant aspects of the bulletin. The corrective actions were properly coordinated by engineering with maintenance and operations.

DETAILS

1.0 Persons Contacted

1.1 Niagara Mohawk Power Corporation (NMPC)

T. R. Egan, Licensing Engineer
T. W. Roman, Station Superintendent NMP-1
J. L. Willis, General Superintendent
M. D. McCrobie, Electrical Maintenance Engineer
N. L. Rademacher, Director Compliance
C. Fischer, Supervisor, Electrical Maintenance
K. J. Sweet, Electrical Maintenance Superintendent
W. J. Connolly, QA Program Manager
K. A. Dahlberg, Site Maintenance Superintendent
S. Doty, Unit 2, Supervisor
R. B. Abbott, Station Superintendent
R. G. Randall, OPS Superintendent, Unit 1
* L. Wolf, Licensing Engineer
* K. Iandolo, Engineer Unit 2
* D. Scobell, Electrical Engineer Unit 1

1.2 U. S. Nuclear Regulatory Commission (NRC)

R. R. Temps, Resident Inspector
W. L. Schmidt, Resident Inspector

* Not present at the exit meeting.

2.0 Purpose

The purpose of this inspection was to review the licensee's actions taken in response to IE Bulletin 85-03, motor operated valve (MOV) common mode failures during plant transients due to improper switch settings and to review the licensee's program to assure the operational readiness of the motor operated valves covered under this bulletin.

3.0 Background

On June 9, 1985, the Davis-Besse Plant experienced a complete loss of main and auxiliary feedwater which was caused, in part, by MOV failures. This event resulted in IE Bulletin 85-03 that promulgated NRC requirements to assure the operational readiness of MOVs in the high pressure coolant injection/core spray and emergency feedwater systems. The bulletin specified that licensees take the following actions.

(a) Review and document the design basis for the operation of each valve, including the maximum differential pressure expected during the normal and abnormal operation.

(b) Using the above data, establish the correct switch settings for torque, torque bypass, position limit and overload for each valve and perform the modifications as needed.

(c) Individual valves should be demonstrated to be operable by testing the valve at the maximum differential pressure based on the performance requirements. In the absence of differential pressure testing, a justification should be provided.

(d) Prepare and revise procedures to ensure that correct switch settings are determined and maintained throughout the life of the plant.

(e) Submit a schedule to accomplish the above program including a final submittal with the results of (b) through (d).

Item (a) is currently under review by the NRC office of Nuclear Reactor Regulation (NRR). The scope of this inspection was to review items (b) through (d).

4.0 Niagara Mohawk Corporation response to IE Bulletin 85-03 (TI 2515/73)

4.1 Status of Commitments

After the initial evaluation of the bulletin, the licensee concluded that Nine Mile Unit 1 does not have any MOVs that fall within the scope of Bulletin 85-03 (Ref. 2 Attachment-1). The NRC letter dated July 9, 1986 (Ref. 3 Attachment-1) concurred with this position. However, the licensee was requested to address the core spray system in the light of the Bulletin as this was the highest pressure safety related system and it was the intent of the Bulletin to address this system.

In a letter dated September 18, 1986 (Ref. 1 Attachment 1), the licensee completed the Bulletin response for selecting, setting and maintaining the settings of the torque switches and limit switches on the MOVs associated with the core spray system. In the same letter, the licensee committed to prepare a critical engineering drawing with switch settings prior to the end of the 1988 refueling outage. This commitment was met on May 16, 1988 and is documented in Dwg. No. F-42124-C. During this inspection, the torque switch adjustments were in progress.

In a letter dated November 13, 1987 (Ref. 4, Attachment-1), the licensee completed the Bulletin response for selecting, setting and maintaining the settings of the torque switches and limit switches on the MOVs associated with High Pressure Core Spray and Reactor Core Isolation Cooling Systems for Nine Mile Point Unit 2. The licensee completed their response to this bulletin, including the field changes, by February 1987.

The motor operated valves identified for Nine Mile Point 1 and 2 for IEB 85-03 consideration are listed in Tables 1 and 2.

4.2 Switch Settings

Item (b) of the bulletin requires that the correct switch settings for torque, torque bypass, position limit and overload for each valve be established. These items are addressed below.

Open Torque Switch and Open Bypass Limit

This switch is normally used as a mechanical fuse to limit the mechanical thrust applied to the valve in the open direction. This switch is usually bypassed during the initial valve unseating which is the most challenging portion of the open stroke. Failure to set this switch to the required value or not bypassing this switch in the initial opening stroke, can prevent the valve from opening.

For Unit 1, the torque switch is bypassed for approximately 5 percent past the unseating of the valve and then the MOV will "ride on" the torque switch until the open limit switch contact opens. The torque switch is currently being set at the same value as the close torque switch. For Unit 2, the torque switch is bypassed for approximately 95% of the opening stroke if the safety function is opening and then the MOV will "ride on" the torque switch until the open limit switch contact opens.

As the valve is not backseated, the valve is not subjected to any undue strain. The torque switch setting in both cases is sufficient to prevent the actuation of the opening torque switch during the design bases operations.

Close Torque Switch

The close torque switch is used to stop the motor rotation on the completion of valve travel in the close direction. Since this switch provides a normal control function and is exercised on every closure stroke, this switch setting needs more careful consideration than the open torque switch. The limiting requirement of the close torque switch is at the end of the closure stroke when the thrust requirements are the highest. The thrust at the point the torque switch trips should equal the most limiting closure thrust requirement including the thrust needed to overcome the differential pressure across the valve. Differential pressure testing using process system pumps with appropriate data gathering and diagnostic evaluation is the positive means of assuring the adequacy of the torque switch set point. Other approaches based on similarity and analysis may also be acceptable with sufficient basis.

In the case of Unit No. 1, the licensee tested all 14 valves in the 1984 and 1986 outages. Of these valves, 4 valves located inside the drywell are required to operate during a design.bases event with significant differential pressure across the valve. However, these valves are known to be operable since the quarterly system surveillance test requires cycling the valves at higher differential pressure than would be experienced if actuated in the auto initiation vessel injection mode. The licensee obtained Limitorque recommendations on required settings and the data sheets that supported these suggested settings. A further calculation was performed to verify the settings and conservative values were chosen as the recommended settings. The MOVATS test equipment was utilized to confirm that sufficient thrust is developed before the limit switch is actuated. See Table 1 for a tabulation of required and final torque switch setpoints. These final settings are to be made in the 1988 outage.

For Unit 2, the licensee had incorporated all the design basis requirements into the procurement document. This included the differential pressures at which the operability of the valve had to be established before the valve is supplied. The licensee has independently verified this data and documented the required thrust values in drawing 12177-EP-410 series, titled, Motor Operated Valve Setpoints and Operation Data. See Table 2 for a tabulation of Torque Switch Reset Values. These settings were made by February 1987. The adequacy of the torque switch setpoints is under review by NRR.

No deficiencies were observed.

Close Torque Switch Bypass

The close torque switch bypass acts in the same manner as the open torque switch bypass; however, contrary to its counter part function, it normally bypasses the torque switch during the lightest duty portion of the stroke, the beginning of the closing stroke. The use of this switch is not critical; however, if utilized it should be set to operate during the initial part of the stroke, to assure that valve closure is not prevented by the torque switch.

The Unit 1 close torque bypass switch is set such that at the starting of the motor, the torque switch is bypassed, and for the remainder of the valve stroke, the torque switch is used in the control circuit.

The Unit 2 close torque switch bypass switch is set based on the direction of the valve motion to perform its safety function. If the valve is required to go closed to perform its safety function, the close torque switch is bypassed for the initial 95% of its closing stroke. The remaining 5% of the stroke is controlled by the torque switch while it is seated. This approach has the additional advantage of making the full torque of the motor available to complete 95% of the closing stroke. Similar bypassing is applied to the opening direction. If the valve does not have a safety function, the torque switch remains active in the circuit for the major portion of the stroke.

Open Limit Switch

This switch provides the control function for determining the upper limit of the valve stem travel in the open direction and stops the motor rotation by opening the circuit. The setting of this switch must assure adequate valve opening and should prevent back seating. Valve backseats are normally to provide a seal that is redundant to the valve packing in order to allow valve packing replacement without the need to drain down the process system. Using the motor power to backseat can and has caused valve stem shearing and stem thread twisting. Therefore, it is important to set the open limit switch away from the back seat with enough margin to allow for motor deenergization and inertia.

Niagara Mohawk has set the open limit switch such that the valve does not back seat by inertia. No problem was identified with this arrangement.

Close Limit Switch

This switch is usually used with the close torque switch in series for over-torque protection. For high speed operators, where torque switches cannot react in sufficient time, the close limit switch deenergizes the motor and the remaining inertia forces seat the valve.

Niagara Mohawk is not utilizing the close limit switch to deenergize the motor for valves covered under this bulletin. All the valves in the scope of this bulletin are seated using the torque switches.

Open/Close Indication

A red light provides a valve open signal. This light is taken from the close rotor limit switch which is set to actuate very close to the end of valve closure. A green light provides a valve closed signal and is taken from the open rotor limit switch actuation. The green light will turn off when the MOV is in the full open position, and the red light will turn off when the MOV is in the full closed position.

Niagara Mohawk Unit 2 MOV's have four rotors and therefore have indication lights from two different rotors. This allows independent adjustment of the two rotors and can be set very close to the actual full open and closed status. For the two rotor MOV configuration, this is not practical due to the torque switch bypass function needed from the same rotor.

In Unit 1 most of the torque bypass switch and indication lights are from the same rotors. Any adjustment to the bypass switch will affect indication. The licensee is performing a modification, Modification No. NI-88-032, to utilize different rotors for the red indicating lamp and for 'open' torque switch bypass. This will eliminate the potential for an MOV to indicate closed while actually being partially (5 to 10%) open. Any changes in limit switch settings can influence MOV stroke time testing as well as valve position dependent interlocks and permissives. The licensee plans to develop new baseline data after this modification.

No discrepancies were observed.

Thermal Overload Relay

Thermal overload relays are used to protect motor winding insulation from breakdown during overload conditions. Devices used appear to uniformly consist of heaters at the motor control center which trip a heat sensitive relay, the contacts of which either interrupt current

to the contractor closure coil (which stops the motor) or initiates an overload alarm, or both. Where thermal overload relays stop operator motor rotation on tripping, the heaters must either be sized to prevent inadvertently stopping the motor or the overload relays must be bypassed when motor operation is important to safety. They should also be sized to protect the motor windings from thermal damage. Regulatory Guide 1.106, thermal overload protection for electric motors on motor operated valves provides guidelines on the design criteria for thermal overloads.

Designs that are being used at this time to eliminate the threat of inadvertent motor trips include: (1) removing the heaters or relay contacts from use; (2) using the relay contacts for alarm only; (3) bypassing the relay contacts during all operating modes except when a valve is being exercised for testing; (4) bypassing the relay contacts only during the presence of an automatic safety actuation signal; and, (5) oversizing the thermal overloads.

The Nine Mile Unit 1 design utilizes the thermal overloads during normal and accident operation. Niagara Mohawk uses the following criteria in sizing the thermal overloads.

1. When carrying locked rotor current, the thermal overload relay should actuate in a time within the motor's limiting time for carrying locked rotor current.

2. When carrying a current equal to nameplate full load current times the service factor, the motor should not trip in a time period less than twice the MOV stroking time.

This approach adequately supports the operation of the valve during normal and abnormal operation. The inspector reviewed the licensee's MOV thermal overload heater calculation that covers all the valves covered by the bulletin. The inspector verified the field installed thermal overloads for valves 40-01, 40-10, 81-01 & 81-22. The installation agreed with the required ratings established in the calculation.

For Unit 2, the thermal overloads are bypassed when the MOVs are called upon to perform a safety function.

4.3 Demonstration of Operability

This involves demonstrating the valve to be operable by testing the valve under maximum differential pressure after changing the individual valve settings as appropriate based on the design bases. In the absence of testing with full differential pressure across the

valve, a justification is to be provided. The use of a MOVATS data base to set the torque switches for a particular type of valve is considered as an acceptable approach to exclude differential pressure testing, provided this type of valve has sufficient test data to establish similarity. However, a suitable test is needed to establish that the desired force is available at the valve seat for closure.

NMPC has utilized manufacturer testing supplemented by MOVATS testing for demonstrating operability of the valves. The MOVATS test records document the thrust developed at the valve seat. The inspectors reviewed the records on the following valves to confirm that the thrust developed is acceptable based on the required thrust for the respective valves and that it is within the permitted limits for the valves.

Unit No. 1

Valve	Recommended Thrust, lbs. Open	Recommended Thrust, lbs. Close	Thrust Developed, lbs. As Per MOVATS Test Open	Thrust Developed, lbs. As Per MOVATS Test Close
40-01	40,800	40,800	59,800	67,800
40-10	40,800	40,800	69,400	76,000
81-01	5,720	5,720	9,100	13,820

Unit No. 2

	(Open/Closed)	Close	Open
2ICS*MOV136	4,225	6,686	5,644
2ICS*MOV122	14,500	19,995	16,695
2ICS*MOV124 '+'	9,100	12,052	8,359*
2ICS*MOV120	10,750	13,671	10,857

+ Safety function is close only.

* In the open direction, the licensee's calculation P 9-1-13, page 11 indicates that the design load is 8873 lbs. However, 2003 lbs. of the design load is due to line presssure which assists in opening the valve. Thus, the measured thrust in the open direction of 8359 lbs. is adequate to open the valve.

The as left values of the torque switch settings were in agreement with the test records that established the valve operability.

The inspectors had no further questions.

4.4 Maintenance and Procedures

The bulletin requires that licensees prepare or revise procedures to ensure that correct switch settings are maintained throughout the life of the plant and also to ensure that applicable industry recommendations are considered in the preparation of the procedure.

The inspectors reviewed the procedures listed in Attachment 1. The licensee had revised these procedures for maintaining the limit and torque switch settings. The specific instructions on installing and setting limit and torque switches incorporated industry recommendations.

The reference addressed in the procedure included IE notices, service information letters, IE bulletins and significant operating experience reports. The procedures contained sufficient details with illustrations to perform the job. The procedure addressed the details on installing torque switches with the spring pack in the relaxed condition, specified the greasing levels and the acceptable level/quantity of grease.

A walkdown was conducted to inspect valve MOV maintenance activities. Where practical, the inspectors verified the grease level in the main gear case and looked for lubrication of the valve stems. These were found to be sufficiently lubricated. The licensee technicians and the staff were knowledgeable in the operation and maintenance of the valves.

Maintenance department personnel have attended the Limitorque training presented by Power Safety International. The training includes operation, maintenance, switch setting, and MOVATS testing. The licensee has also offered the INPO accredited course EM-231 entitled "Valve Actuators" for their employees.

The MOVATS technicians were present at the site during the inspection. Their services were utilized for technical guidance and interpretation of test data. The inspectors reviewed the MOVAT test results analysis and found that all the comments were resolved satisfactorily. Based on the records available through NPRDS, the licensee had no MOV failures in the year 1987.

During the walkdown, the inspectors noticed that torque switch settings were slightly lower than the recommended settings in the drawings. The licensee explained that for these particular valves the desired torque was available at a torque switch setpoint lower than the recommended values. Since the objective of the torque switch setpoint is developing sufficient torque to operate the

valve, the evidence of sufficient torque even at a lower setting satisfies the requirement. This lower torque switch setting was documented in the work order. During the inspection, the licensee committed to transfer these differences in the torque switch set-points into the controlled documents in order to avoid any future confusion.

The inspectors reviewed the post maintenance testing of MOVs. The licensee is currently timing the valve stroke to establish operability after minor maintenance and tightening of the packing. The licensee concurred with the inspectors that the stroking does not establish the operability of the valve when subjected to differential pressure across the valve. The licensee is planning to look into this matters based on the industry experience..

5.0 Conclusions

The licensee has addressed all the significant aspects of the bulletin. All the commitments communicated to NRC were verified to be met. The engineering and maintenance groups have taken special training for addressing MOV concerns. Based on NPRDS failure data study Nine Mile Point had a 0.0% failure rate for the year 1987. Based on the review of the licensee activities, it was concluded that there is reasonable assurance that the valves covered under the bulletin can perform their safety function during normal and abnormal operation.

6.0 Exit Interview

At the conclusion of the inspection on July 29, 1988, the inspectors met with the licensee representatives, denoted in section 1.0. The inspector summarized the scope and findings of the inspection at that time. No written material was given to the licensee during this inspection.

REFERENCES

1. Licensee letter from C. V. Mangan to Thomas E. Murley, NRC, dated September 18, 1986.

2. Licensee letter from C. V. Mangan to Thomas Murley, NRC, dated May 16, 1986.

3. NRC letter from Richard W. Starostecki to C. V. Mangan, NMPC, dated July 9, 1986.

4. Licensee letter to NRC from C. V. Mangan, dated November 13, 1987.

Maintenance Procedures

1. Limitorque disassembly and assembly of type SMB, SB and HBL series operators NI-EMP-GEN-110 Revision 0

2. Limitorque valve and MCC Bucket Inspection of AC motor Type Limitorque NI-EMP-GEN-R120 Revision 1

3. Limitorque valve and MCC Bucket Inspection of DC motor type Limitorque NI-EMP-GEN-R121 Revision 1

4. Limitorque motor operated valve testing utilizing MOVATS-200 NI-EMP-GEN-V122 Revision 0

5. Limitorque motor operated valve testing utilizing MOVATS-2150 NI-EMP-GEN-V125 Revision 0

TABLE 1

Nine Mile Point Unit 1

CORE SPRAY SYSTEM

Plant I.D. No.	Torque Switch Settings				Limitorque Specified Torque Switch Setting	
	As-Found		Final			
	Open	Close	Open	Close	Standard	Maximum
40-01	2	3	3	3	2-3/4	3-1/2
40-02	3	2	3	3	3	3
40-05	2	1-1/2	2	2	2	2-1/2
40-06	1-1/2	1-1/2	2	2	2	2-1/2
40-09	2-3/4	2-3/4	3	3	2-3/4	3-1/2
40-10	2-3/4	2-3/4	3	3	2-3/4	3-1/2
40-11	2-3/4	2-3/4	3	3	2-3/4	3-1/2
40-12	3	3	3	3	3	3
40-30	2	3	$1^{3}/^{4}$	$1^{3}/^{4}$	1-3/4	4
40-31	2	3	$1^{3}/^{4}$	$1^{3}/^{4}$	1-3/4	4
81-01	1-1/2	1	1-1/4	$1^{1}/^{4}$	1-1/4	2-1/2
81-02	2	2	1-1/4	1-1/4	1-1/4	2-1/2
81-21	1-1/2	1-1/2	1-1/4	1-1/4	1-1/4	2-1/2
81-22	1-1/2	1-1/2	1-1/4	1-1/4	1-1/4	2-1/2

TABLE 2

Nine MIle Point Unit #2

Summary of Torque Switch Reset
Per Bulletin 85-03

MOV NO.	TSS BEFORE 85-03 OPEN	/ CLOSE	TSS REQ'D. MIN	/ MAX	RESET REQ'D.	RESET PERFORMED
2ICS*MOV116	1 1/2	1 1/2	1 1/2	1 1/2	No	NR
2ICS*MOV120	1 1/4	1 1/4	3 1/4	3 1/4	Yes	Yes, by WR 106909
2ICS*MOV121	2 3/4	1 3/4	2 7/8	2 7/8	Yes	Yes, by WR 106932
2ICS*MOV122	1 3/4	1 3/4	1 3/4	1 3/4	No	NR
2ICS*MOV124	1 1/2	2	2 1/4	2 1/4	Yes	No, MOVAT testing showed sufficient thrust obtained in closing. Valve safety direction is to close.
2ICS*MOV126	1	2	2 1/4	2 1/4	Yes	Yes, by WR 106905
2ICS*MOV128	3 3/4	3 3/4	3 3/4	3 3/4	No	NR
2ICS*MOV129	2	2	2	2	No	NR
2ICS*MOV136	2	2	1 3/4	2	No	NR
2ICS*MOV143	1 1/4	1 1/4	1 1/2	1 3/4	Yes	Yes, by WRs 106774 & 106906
2ICS*MOV148	1	1 3/4	1	2 1/4	No	NR
2ICS*MOV159	1	1	1 1/2	3	Yes	No, MOVAT testing showed sufficient thrust obtained to open/close valve @ TSS of 1/1.
2ICS*MOV164	1 1/2	1 1/2	1 1/2	2 1/4	No	NR
2ICS*MOV170	1	2	1 1/2	2	Yes	No, valve is set correctly to close. When opening, TSS is bypassed for 95% of the travel.

TABLE 2
(Cont'd.)

Nine MIle Point Unit #2

Summary of Torque Switch Reset
Per Bulletin 85-03

MOV NO.	TSS BEFORE 85-03 OPEN	/ CLOSE	TSS REQ'D. MIN	/ MAX	RESET REQ'D.	RESET PERFORMED
2ICS*MOV101	1	1	2 1/2	3 1/2	Yes	No, MOVAT testing showed req'd thrust available to close. When opening, TSS is bypassed for 95% of the travel.
2CSH*MOV105	1 1/2	1 1/2	2	2 1/2	Yes	No, MOVAT testing showed req'd. thrust available to close. When opening, TSS is bypassed for 95% of the travel.
2CSH*MOV107	2 1/2	2 1/2	2	4	No	NR
2CSH*MOV110	2	2	2 1/4	3 3/4	Yes	Yes, by WR 106837
2CSH*MOV111	2	2	2 3/4	4 1/2	Yes	Yes, TS reset to 2 1/8 MOVAT testing showed req'd. thrust developed at 2 1/8.
2CSH*MOV112	2	2	2 1/4	3 3/4	Yes	No, MOVAT testing showed req'd. thrust developed.
2CSH*MOV118	1 1/2	1 1/2	2	3	Yes	No, MOVAT testing showed req'd. thrust developed.

NOTES:

TSS - Torque Switch Setting
NR - Not Required
WR - Work Request