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JOSEPH A. TIERNAN
VICE PRESIDENT
NUCLEAR ENERGY

January 28, 1988

U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit Nos. 1 & 2; Docket Nos. 50-317 & 50-318
IE Bulletin 85-03, "Motor-Operated Valve Common Mode Failures During Plant Transients Due to Improper Switch Settings

REFERENCES: (a) Letter from Mr. J. A. Tiernan (BG&E) to Dr. T. E. Murley (NRC), dated May 15, 1986, same subject

(b) Letter from Mr. J. A. Tiernan (BG&E) to NRC Document Control Desk, dated September 1, 1987, Response to Request for Additional Information on IE Bulletin 85-03

Gentlemen:

This refers to IE Bulletin 85-03, Item f, which requested a written report on completion of the subject program. Enclosure (1) provides: (1) a verification of completion of the requested program; (2) a summary of the findings as to valve operability prior to any adjustments as a result of the subject bulletin; and (3) a summary of data in accordance with the suggested format. In conjunction with Reference (a), this letter provides the information required by IE Bulletin 85-03.

Should you have any further questions regarding this reply, we will be pleased to discuss them with you.

Very truly yours,

JATiernan

JAT/SRC/dlm

Enclosure

IE11
1/1

cc: D. A. Brune, Esquire
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ENCLOSURE (1)

FINAL REPLY TO IE BULLETIN 85-03

This letter provides the final information necessary to verify completion of all actions required by IE Bulletin 85-03. No Motor-operated valves (MOVs) were found inoperable. Attachment A summarizes the data requested. The following notes apply to this data.

1. Test differential pressures (d/p) were the maximum obtainable in the test configuration (simulated accident condition). Full High Pressure Safety Injection (HPSI) pump flow was directed into the Reactor Coolant System which was vented to the atmosphere. In five cases, the HPSI system was not capable of producing maximum design d/p (1310 psid versus the 1313 psid required). For these cases the difference is considered insignificant.

2. The torque switch settings are explained in our response to Action Item c. That is, the differences between test settings and final settings are discussed. No changes were required as a result of testing performed.

3. The Open To Close ("C") test d/p readings were taken with full flow and with valves fully open. Upon subsequent closing, the d/p's were measured and the maximum values were noted.

The following discussion addresses each action item of IE Bulletin 85-03 and our response. Additional information can be found in Reference (b) to the cover letter.

Action Item a:

This item is complete. The results of this item were reported in Reference (a) and supplemented by Reference (c).

Action Item b:

A maintenance procedure exists at Calvert Cliffs to control the set-up, adjustment and testing of MOV controls. This procedure includes torque switch, torque bypass switch and limit switch instructions. (Attachment B provides the MOV Control Program at Calvert Cliffs.) Motor overloads were established and controlled by electrical drawings. The initial switch settings and methods of control were established by the Architect/Engineer. This information was provided to Calvert Cliffs in electrical drawings, control schemes and MOV Data Sheets. Because of the procedures and documents available, the effort required for Action Item b consisted primarily of verifying the validity of historical switch settings listed in the MOV Data Sheets. This was accomplished in-house as follows: The required torque for each MOV was determined using a method published by Limitorque in their MOV Selection Guides. Then we obtained from Limitorque correlations specific to the spring packs installed in our Bulletin MOVs. These correlations related torque switch scale divisions (which are actually a measure of spring pack deflection) to applied torque. Thus the required torque from the calculation could be translated to a corresponding torque switch setting. A review of overloads had been conducted previously as recommended by IE Circular 81-13.

The calculational methodology was developed and the torque switch settings were derived in accordance with IE Bulletin 85-03. These newly derived settings were found to closely agree with the historical MOV Data Sheets' settings. No valves were determined to be inoperable as a result of the calculations.

Action Item c:

The MOVs subject to the requirements of the bulletin were tested at maximum d/p and full flow. These valves were tested with "as-found" switch settings. Additionally, the Unit One MOVs were tested at the reduced voltage of 432 volts (minimum 480-volt bus voltage allowed by Technical Specifications). All MOVs operated properly in both the open and shut directions. There were no observed problems.

No changes to the switch settings were required as a result of the testing. However, as shown on Attachment A, some torque switch settings were changed. These were done to increase the conservatism in the settings. Some additional torque switch setting changes are planned just prior to the next maximum d/p test. These changes will be made to standardize settings on similar MOVs in order to assist in long-term valve performance trending.

Action Item d:

As stated previously, the calculational method for determining torque switch settings has been developed and procedures are in place to maintain torque switch, torque bypass switch and limit switch settings. Some procedural enhancements were required to meet the intent of the bulletin. The control of torque switch settings for those MOVs subject to the requirements of the bulletin has been formalized. New procedures were developed to perform maximum d/p testing of IE Bulletin 85-03 MOVs on a refueling interval basis. We have also developed post-maintenance testing guidelines for the bulletin MOVs.

ATTACHMENT A

VALVE						VALVE OPERATOR			DVF	BASIS ΔP		TEST ΔP		T/S @ TEST		T/S FINAL		
COMP. ID	M	T	MDL	S	R	M	RPM	GR	FUNC	O	C	O	C	O	C	O	C	
1MOV616	V	GL	P 34657	2	1500	-0025	1700	38.6:1	LIV	1295	1295	1340	1090	1.0	2.25	1.5	1.5	*
1MOV617	V	GL	P 34657	2	1500	-0025	1700	38.6:1	LIV	1295	1295	1320	1110	2.25	1.75	1.5	1.5	*
1MOV626	V	GL	P 34657	2	1500	-0025	1700	38.6:1	LIV	1295	1295	1340	1060	2.0	2.25	1.5	1.5	*
1MOV627	V	GL	P 34657	2	1500	-0025	1700	38.6:1	LIV	1295	1295	1320	1070	1.5	1.75	1.5	1.75	
1MOV636	V	GL	P 34657	2	1500	-0025	1700	38.6:1	LIV	1295	1295	1330	1080	2.5	2.5	1.5	1.5	*
1MOV637	V	GL	P 34657	2	1500	-0025	1700	38.6:1	LIV	1295	1295	1310	1100	1.5	1.5	1.5	1.5	
1MOV646	V	GL	P 34657	2	1500	-0025	1700	38.6:1	LIV	1294	1294	1330	1040	1.75	2.75	1.5	1.5	*
1MOV647	V	GL	P 34657	2	1500	-0025	1700	38.6:1	LIV	1294	1294	1310	1040	2.5	1.5	1.5	1.5	*
1MOV653	V	GA	P 34658	4	900	-0025	1700	36.2:1	PDIV	1313	1313	1310	390	1.0	1.0	1.5	1.5	
1MOV654	V	GA	P 34658	6	900	-040	1700	35.4:1	TIV	1313	1313	1330	360	2.25	2.5	3.0	3.0	
1MOV655	V	GA	P 34658	4	900	-0025	1700	36.2:1	PDIV	1313	1313	1310	350	1.0	1.0	1.5	1.5	
1MOV656	V	GA	P 34658	6	1500	-160	3405	35.4:1	TIV	1313	1313	1310	350	2.25	2.25	2.25	2.25	
2MOV616	V	GL	P 34657	2	1500	-0025	1700	38.6:1	LIV	1295	1295	1325	940	1.5	1.5	1.5	1.5	
2MOV617	V	GL	P 34657	2	1500	-0025	1700	38.6:1	LIV	1295	1295	1320	950	1.5	1.5	1.5	1.5	
2MOV626	V	GL	P 34657	2	1500	-0025	1700	38.6:1	LIV	1295	1295	1325	1060	1.5	1.5	1.5	1.5	
2MOV627	V	GL	P 34657	2	1500	-0025	1700	38.6:1	LIV	1295	1295	1320	1070	1.5	1.5	1.5	1.5	
2MOV636	V	GL	P 34657	2	1500	-0025	1700	38.6:1	LIV	1295	1295	1325	980	1.5	1.25	1.5	1.25	
2MOV637	V	GL	P 34657	2	1500	-0025	1700	38.6:1	LIV	1295	1295	1310	1090	1.5	1.5	1.5	1.5	
2MOV646	V	GL	P 34657	2	1500	-0025	1700	38.6:1	LIV	1294	1294	1320	1205	1.0	2.0	1.5	1.5	
2MOV647	V	GL	P 34657	2	1500	-0025	1700	38.6:1	LIV	1294	1294	1310	1180	1.0	2.0	1.5	1.5	
2MOV653	V	GA	P 34658	4	900	-0025	1700	36.2:1	PDIV	1313	1313	1325	350	1.5	1.5	1.5	1.5	
2MOV654	V	GA	P 34658	6	900	-040	1700	35.4:1	TIV	1313	1313	1340	350	2.25	2.25	3.0	3.0	
2MOV655	V	GA	P 34658	4	900	-0025	1700	36.2:1	PDIV	1313	1313	1310	310	1.5	1.5	1.5	1.5	
2MOV656	V	GA	P 34658	6	1500	-160	1720	35.4:1	TIV	1313	1313	1310	305	2.25	2.25	2.25	2.25	

VALVE
M = MANUFACTURER
V = VELAN
T = TYPE
GL = GLOBE
GA = GATE
S = SIZE IN INCHES
R = PRIMARY RATING IN LBS.
MDL = MODEL

VALVE OPERATOR
M = MANUFACTURER
ALL ARE LIMITORQUE
SMB -
RPM = MOTOR
GR = GEAR RATIO

DVF
DVF = DESIGN VALVE FUNCTION
LIV = LOOP ISOLATION VALVE
PDIV = PUMP DOWNSTREAM ISOLATION VALVE
TIV = TRAIN ISOLATION VALVE
ALL VALVES ARE IN THE HIGH PRESSURE SAFETY INJECTION SYSTEM

TEST ΔP
O = CLOSED TO OPEN
C = OPEN TO CLOSE
ALL PRESSURES IN PSIG.
VALVE CLOSING PRESSURES ARE WITH FLOW.

T/S FINAL
T/S = TORQUE SWITCH
O = OPEN
C = CLOSE
* = T/S TO BE ADJUSTED JUST PRIOR TO NEXT ΔP TEST

ATTACHMENT B

CALVERT CLIFFS IE BULLETIN 85-03 MOTOR-OPERATED VALVE PROGRAM

I. Method of MOV Control

With a few exceptions, the normal industry practice is to seat the valve on action of the torque switch and to back seat the valve on action of the electrical limit switch. The rationale for this practice is to ensure tight seating of the valve and a positive stop of the operator on the back seat since the back seat is the weakest mechanical part of the valve. This requires precise torque switch and torque bypass switch setting determination and control. The consequences of inadequate torque switch and bypass switch settings are great.

Industry experience indicates that the leading causes of valve failure or inoperability is the mis-adjustment or failure of the torque switch or its components. The torque switch is a spring centered and balanced device. Its ability to stay balanced and in adjustment is suspect. It is not a direct acting device, but depends upon the proper actions and calibration of the spring pack. The spring pack depends upon the proper grease and gap in the spring pack cavity and the suppression of hydraulic lock-up in the cavity. If the torque switch or any of its components fail or are out of adjustment, or are installed incorrectly, the resulting failure mode could be bent or broken valve stems, burned out motors, valve seat damage, failures to operate, etc.

The Calvert Cliffs method of control substantially reduces these concerns because the torque switch is relegated to essentially a backup role for both opening and closing. The electrical limit switches are used as the primary control device for closing as well as opening. The limit switch is a less complex and a more positive acting device as it is directly geared to motor-operated drive gears. It does not depend on a spring pack. With valve seating controlled by a limit switch, there is less wear on valve and motor-operated components because less force is being absorbed by the valve seat, valve stem, and operator gears. Also, because the valve is not being "torqued" shut, less force is required to reopen the valve.

The disadvantage of limit switch seating is that seat tightness may not be as uniform as with torque switch control. Also, "coastdown" of operator components must be allowed for. On closing, the "coastdown" accomplishes the final seating after the limit switch stops the motor. On opening, "coastdown" has to be compensated for to prevent excessive back seating. These disadvantages are overcome by proper post-adjustment operational checks. If a limit switch fails to operate (opening or closing), then the torque switch will act to prevent valve/operator damage. The torque switch is also active during operation between the open and close limits because of two train geared limit switches (i.e., limit switch and torque bypass switch operation occur simultaneously). This provides protection against binding and/or motor damage during travel between the open and close limits.

At Calvert Cliffs, limit switch control has proven to be a valid method of control which has resulted in a good MOV operational history.

ATTACHMENT B

CALVERT CLIFFS IE BULLETIN 85-03 MOTOR-OPERATED VALVE PROGRAM

II. Procedures for MOVs

The Calvert Cliffs program consists of maintenance procedures, functional test procedures, preventive maintenance procedures, and operational procedures as follows:

- Maintenance Procedures: detailed disassembly/re-assembly instructions for various size motor operators.

- Functional Test Procedures: Contains instructions for limit switch, torque switch, and torque bypass inspection and adjustment; electrical checks; post switch adjustment operational checks; motor current data; stroke timing; gives guidelines for post-maintenance testing.

- Preventive Maintenance Procedures: Mechanical - Lubrication of operator; Electrical - Inspections, integrity checks, insulation resistance measurements.

- Operational Procedures: Full flow maximum differential pressure testing; stroke timing; motor current data.

III. Post Maintenance Testing of MOVs

Written guidance is provided to ensure proper post-maintenance testing is performed. This guidance specifies increasing levels of post-maintenance testing for a correspondingly increasing complexity of maintenance performed.

IV. Summary

The Calvert Cliffs program for IE Bulletin 85-03 MOVs combines limit switch control with full differential pressure testing (on a refueling interval basis) to ensure MOV operability. The method of control has proven to provide reliable MOV operation and has limited the maintenance required due to degradation of operators components. Full differential pressure testing of this bulletin's MOVs under "as-found" conditions also verified the validity of this program.