Public Service
Electric and Gas
Company

Corbin A. McNeill, Jr.
Vice President -
Nuclear

Public Service Electric and Gas Company P.O. Box 236, Hancocks Bridge, NJ 08038 609 339-4800

May 27, 1986

NLR-N86080

U. S. Nuclear Regulatory Commission
Region 1
631 Park Avenue
King of Prussia, PA 19406

Attention: Dr. Thomas E. Murley,
Regional Administrator

Gentlemen:

IE BULLETIN 85-03
MOTOR-OPERATED VALVE COMMON MODE FAILURES DURING
PLANT TRANSIENTS DUE TO IMPROPER SWITCH SETTINGS
SALEM AND HOPE CREEK GENERATING STATION
FACILITY OPERATING LICENSES DPR-70, DPR-75 AND NPF-50

Public Service Electric and Gas Company (PSE&G) hereby forwards its response to IE Bulletin 85-03 for your review. Attachment 1 provides the plant specific response for Salem Generating Station, Units 1 and 2. Attachment 2 provides the response for Hope Creek Generating Station.

Should you have any questions regarding this information, please feel free to contact us.

Sincerely,

Attachments

C Mr. Donald C. Fischer
Licensing Project Manager - Salem

Mr. Thomas J. Kenny
Senior Resident Inspector - Salem

IE11
1/1

C Mr. Dave Wagner
Licensing Project Manager - Hope Creek

Mr. William Borchardt
Senior Resident Inspector - Hope Creek

US Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Ref: IE BULLETIN 85-03

STATE OF NEW JERSEY)
) SS.
COUNTY OF SALEM)

Corbin A. McNeill, Jr., being duly sworn according to law deposes and says:

I am Vice President of Public Service Electric and Gas Company, and as such, I find the matters set forth in our letter dated May 27, 1986, concerning our response to IE Bulletin 85-03, Operating Licenses DPR-70, DPR-75 and NPF-50, are true to the best of my knowledge, information and belief.

Subscribed and Sworn to before me
this 27th day of May, 1986

Donna G. Hitchner
Notary Public of New Jersey

DONNA G. HITCHNER
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires March 24, 1987

My Commission expires on

ATTACHMENT 1
SALEM GENERATING STATION
UNITS 1 AND 2
RESPONSE TO IE BULLETIN 85-03

In preparing a response to IE Bulletin 85-03, Public Service Electric and Gas Company (PSE&G) contacted NRC Region 1 to clarify the scope of review required for Pressurized Water Reactors (PWR). In a telephone conversation with Mr. R. J. Kiessel of Region 1, it was determined that for PWRs, only the Auxiliary Feedwater System (AFW) and the highest pressure Emergency Core Cooling System (ECCS) need be considered.

The AFW systems for Salem Units 1 and 2 are identical. All power operated valves utilized in the AFW systems are air operated and as such, are not subject to the requirements of Bulletin 85-03. The highest pressure ECCS subsystem utilizes two centrifugal charging pumps to draw water from the Refueling Water Storage Tank (RWST) and discharge through the Boron Injection Tank (BIT) to the four reactor coolant loop cold legs. This arrangement is identical for both Salem Units.

The following paragraphs provide PSE&G's response to items (a) through (f) of Bulletin 85-03, insofar as the ECCS is affected.

Item (a)

> "Review and document the design basis for the operation of each valve. This documentation should include the maximum differential pressure expected during both opening and closing the valve for both normal and abnormal events to the extent that these valve operations and events are included in the existing, approved design basis, (i.e., the design basis documented in pertinent licensee submittals such as FSAR analyses and fully-approved operating and emergency procedures, etc.). When determining the maximum differential pressure, those single equipment failures and inadvertent equipment operations (such as inadvertent valves closures or openings) that are within the plant design basis should be assumed."

PSE&G Response

The valves requiring analysis in accordance with item (a) and their appropriate differential pressures are listed below. In determining the maximum differential pressure, the worst credible conditions that a valve might experience were postulated. This included the consideration of equipment failure(s) and inadvertent equipment operations. In some cases, this approach required the assumption of more than one component failure and/or operator error. However, by employing this methodology it can be assured that plant conditions based upon the updated FSAR analyses, ERGs, and the other approved operating and emergency procedures would be enveloped.

VALVES SUBJECT TO BULLETIN 85-03 ANALYSIS

VALVE NO.	DP (PSID)	DIRECTION*	FUNCTION
SJ1, SJ2	185	Close	Suction from RWST
SJ4, SJ5	2670	Open	Inlet to BIT
SJ12, SJ13	2670	Open	BIT discharge to RCS cold legs
SJ45's	185	Open	Suction from RHR system
SJ113's	185	Open	Charging system and Safety Injection system suction cross connect
CV40, CV41	85	Close	Suction from Volume Control Tank
CV68, CV69	2670	Close	Normal charging system isolation
CV139, CV140	2670	Open	Charging pump mini-flow
CV175	185	Close	Emergency boration

* Direction in which the highest DP is postulated to occur, and not necessarily the direction for which the valve performs its safety function.

Item (b)

"Using the results from item (a) above, establish the correct switch settings. This shall include a program to review and revise, as necessary, the methods for selecting and setting all switches, (i.e., torque, torque bypass, position limit, overload) for each valve operation (opening and closing).

"If the licensee determines that a valve is inoperable, the licensee shall also make an appropriate justification for continued operation in accordance with the applicable technical specification."

PSE&G Response

A program for selecting correct valve switch settings has been initiated. This program consists of the following elements:

1. Development of an analytical method for determining the valve actuator force required to overcome a given differential pressure.

2. Calculation of valve actuator force required to overcome the maximum differential pressure given in response to item (a).

3. Stroke testing (i.e. no differential pressure present) of each valve identified in (a), using the Motor Operated Valve Analysis and Test System (MOVATS) to determine proper torque, torque bypass, and limit switch settings.

4. Field testing using (MOVATS) to verify the analytical method developed in 1.

Field testing as discussed in item (4) will utilize MOVATS to determine the actual valve actuator forces developed at attainable (i.e., less than maximum) differential pressures. The valves tested will be representative of those listed in response to item (a), but not necessarily identical. In some cases, test data obtained from facilities other than Salem may be used. Verification of the analytical method will consist of comparing the calculated valve actuator force required to overcome the differential pressure attained during the test with the actual valve actuator force developed during the test. Completion of this program, including necessary procedural revisions, is scheduled for October 31, 1987.

For any valve determined to be inoperable, i.e. the motor operator is unable to deliver the required thrust to overcome the differential pressure identified in item (a), a justification for continued operation will be provided.

Item (c)

"Individual valve settings shall be changed, as appropriate, to those established in item b, above. Whether the valve setting is changed or not, the valve will be demonstrated to be operable by testing the valve at the maximum differential pressure determined in item a above with the exception that testing motor-operated valves under conditions simulating a break in the line containing the valve is not required. Otherwise, justification should be provided for any cases where testing with the maximum differential pressure cannot practicably be performed. This justification should include the alternative to maximum differential pressure testing which will be used to verify the correct settings.

"Note: This bulletin is not intended to establish a requirement for valve testing for the condition simulating a break in the line containing the valve. However, to the extent that such valve operation is relied upon on the design basis, a break in the line containing the valve should be considered in the analyses prescribed in items a and b above. The resulting switch settings for pipe break conditions should be verified, to the extent practical, by the same methods that would be used to verify other settings (if any) that are not tested at the maximum differential pressure.

"Each valve shall be stroke tested, to the extent practical, to verify that the settings defined in item b above have been properly implemented even if testing with differential pressure can not be performed."

PSE&G Response

The final valve switch settings will be based upon the program described in response to item (b). Due to the nature of the postulated failures and the adverse system configurations required to achieve the maximum differential pressures provided in response to item (a), it is not practical to test each valve at the maximum differential pressure. Differential pressure testing will be performed to the extent described in response to item (b). This testing verifies the adequacy of the analytical method used for calculation of valve actuator force requirements.

Using the calculated valve actuator forces required to overcome the maximum differential pressure, each valve identified in response to item (a) will be stroke tested with MOVATS to verify that the final valve switch settings assure proper valve operation at the maximum differential pressure. This testing is performed as an integral part of the program discussed in response to item (b).

Item (d)

"Prepare or revise procedures to ensure that correct switch settings are determined and maintained throughout the life of the plant. Ensure that applicable industry recommendations are considered in the preparation of these procedures."

PSE&G Response

Salem currently has permanent plant procedures that reflect the switch settings of motor-operated valves. These procedures will be revised to reflect the results generated in the previously discussed portions of the program. Scheduled completion for this activity is October 31, 1987.

Item (e)

"Within 180 days of the date of this bulletin, submit a written report to the NRC that: (1) reports the results of item a and (2) contains the program to accomplish items b through d above including a schedule for completion of these items."

PSE&G Response

Refer to the response to items (a) through (d) above.

Item (f)

"Provide a written report on completion of the above program. This report should provide (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 this bulletin, and (3) a summary of data in accordance with Table 2, Suggested Data Summary Format. The NRC staff intends to use this data to assist in the resolution of Generic Issue II.E.6.1. This report shall be submitted to the NRC within 60 days of completion of the program. Table 2 should be expanded, if appropriate, to include a summary of all data required to evaluate the response to this bulletin."

PSE&G Response

A written report will be issued within 60 days after completion of the above program.

ATTACHMENT 2
HOPE CREEK GENERATING STATION
RESPONSE TO IE BULLETIN 85-03

Public Service Electric and Gas Company has conducted an extensive review program for "Q" safety related motor operated valves in use at Hope Creek as part of the effort to prepare Hope Creek for commercial operation. This program utilized the Motor Operated Valve Analysis and Test System (MOVATS) to demonstrate and document motor operator seating thrust, limit switch settings, motor current values, and valve timing in accordance with appropriate design specifications.

The following paragraphs provide PSE&G's response to items (a) through (f) of IE Bulletin 85-03.

Item (a)

"Review and document the design basis for the operation of each valve. This documentation should include the maximum differential pressure expected during both opening and closing the valve for both normal and abnormal events to the extent that these valve operations and events are included in the existing, approved design basis, (i.e., the design basis documented in pertinent licensee submittals such as FSAR analyses and fully-approved operating and emergency procedures, etc.). When determining the maximum differential pressure, those single equipment failures and inadvertent equipment operations (such as inadvertent valves closures or openings) that are within the plant design basis should be assumed."

PSE&G Response

The valves requiring analysis in accordance with item (a) and their appropriate differential pressures are listed in Table 1.

Item (b)

"Using the results from item (a) above, establish the correct switch settings. This shall include a program to review and revise, as necessary, the methods for selecting and setting all switches, (i.e., torque, torque bypass, position limit, overload) for each valve operation (opening and closing).

"If the licensee determines that a valve is inoperable, the licensee shall also make an appropriate justification for continued operation in accordance with the applicable technical specification."

PSE&G Response

The program for selecting correct valve switch settings at Hope Creek is complete. That program consisted of the following elements:

1. Calculation of design differential pressures during the preparation of equipment specifications.

2. Development of initial torque switch settings by the valve or motor-operator vendors.

3. Vendor testing of representative valves at design flows and differential pressures to verify the calculations performed in (1), and the switch settings selected in (2).

4. Stroke testing (i.e. no differential pressure present) of all valves listed in Table 1, using the Motor Operated Valve Analysis and Test System (MOVATS) to verify proper torque, torque bypass, and limit switch settings.

Limit switch settings were developed to meet system requirements (e.g. bypass limits, indication lights, system interlocks, etc.). For Hope Creek, all "Q" safety related valves have the motor overloads bypassed during normal operation to assure that for any event, the valves will operate. Additionally, existing circuitry permits all switches to be bypassed from the control room.

Hope Creek completed this program during initial testing of systems in support of plant licensing. As such the requirement to provide justifications for continued operation is not applicable.

Item (c)

"Individual valve settings shall be changed, as appropriate, to those established in item b, above. Whether the valve setting is changed or not, the valve will be demonstrated to be operable by testing the valve at the maximum differential pressure determined in item a above with the exception that testing motor-operated valves under conditions simulating a break in the line containing the valve is not required. Otherwise, justification should be provided for any cases where testing with the maximum differential pressure cannot practicably be performed. This justification should include the alternative to maximum differential pressure testing which will be used to verify the correct settings.

"Note: This bulletin is not intended to establish a requirement for valve testing for the condition simulating a break in the line containing the valve. However, to the extent that such valve operation is relied upon on the design basis, a break in the line containing the valve should be considered in the analyses prescribed in items a and b above. The resulting switch settings for pipe break conditions should be verified, to the extent practical, by the same methods that would be used to verify other settings (if any) that are not tested at the maximum differential pressure.

"Each valve shall be stroke tested, to the extent practical, to verify that the settings defined in item b above have been properly implemented even if testing with differential pressure can not be performed."

PSE&G Response

The final valve switch settings were based upon the program described in response to item (b). Testing at design flow and differential pressure testing was performed on representative "Q" safety related valves, but not on the valves listed in Table 1. This testing verified both the analytical method used in determining the design differential pressures and the vendors ability to accurately determine proper torque switch settings for a given differential pressure. As such, differential pressure testing of the valves listed in Table 1 is not required.

As discussed previously in the response to item (b), each valve listed in Table 1 has been stroke tested using MOVATS, to verify implementation of proper switch settings.

Item (d)

"Prepare or revise procedures to ensure that correct switch settings are determined and maintained throughout the life of the plant." Ensure that applicable industry recommendations are considered in the preparation of these procedures."

PSE&G Response

Procedures GTP-8 and GTI-08B-0001 were used during pre-operational testing for original valve setup. Hope Creek Maintenance Procedure MD-GP.ZZ-031(Q) is currently being used to ensure correct switch settings are determined and maintained. This procedure encompasses all known information at this time to prevent malfunction or mis-operation of motor operated valves.

Item (e)

"Within 180 days of the date of this bulletin, submit a written report to the NRC that: (1) reports the results of item a and (2) contains the program to accomplish items b through d above including a schedule for completion of these items."

PSE&G Response

Refer to items (a) through (d) above.

Item (f)

> "Provide a written report on completion of the above program. This report should provide (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 this bulletin, and (3) a summary of data in accordance with Table 2, Suggested Data Summary Format. The NRC staff intends to use this data to assist in the resolution of Generic Issue II.E.6.1. This report shall be submitted to the NRC within 60 days of completion of the program. Table 2 should be expanded, if appropriate, to include a summary of all data required to evaluate the response to this bulletin."

PSE&G Response

The information contained in Table 1, in combination with responses (a) through (e) above, provides a complete response to IE Bulletin 85-03.

TABLE 1

REACTOR CORE ISOLATION COOLING

1. STEAM LINE INBOARD ISOLATION:

VALVE		VALVE OPERATOR		DIFFERENTIAL PRESSURE DATA	
ID#	- 1-FC-V001	ID#	- 1-FC-HV-F007	NORMAL OPEN	- 0 PSI
MANUFACTURER	- ANCHOR/DARLING	MANUFACTURER	- LIMITORQUE	NORMAL CLOSE	- 1125 PSI
TYPE	- GATE	MODEL	- SMB-00	ABNORMAL OPEN	- 1375 PSI
SIZE	- 4"	MOTOR PPM	- 1700	ABNORMAL CLOSE	- 1375 PSI
RATING	- 900 LB.	OUTPUT SPEED	- 11 SECONDS	TORQUE SET/OPEN	- 2.25
				TORQUE SET/CLOSE	- 2.25

2. STEAM LINE OUTBOARD ISOLATION:

VALVE		VALVE OPERATOR		DIFFERENTIAL PRESSURE DATA	
ID#	- 1-FC-V002	ID#	- 1-FC-FV-F008	NORMAL OPEN	- 0 PSI
MANUFACTURER	- ANCHOR/DARLING	MANUFACTURER	- LIMITORQUE	NORMAL CLOSE	- 1125 PSI
TYPE	- GATE	MODEL	- SMB-00	ABNORMAL OPEN	- 1375 PSI
SIZE	- 4"	MOTOR PPM	- 1700	ABNORMAL CLOSE	- 1375 PSI
RATING	- 900 LB.	OUTPUT SPEED	- 11 SECONDS	TORQUE SET/OPEN	- 2.25
				TORQUE SET/CLOSE	- 2.25

3. TURBINE INLET ISOLATION:

VALVE		VALVE OPERATOR		DIFFERENTIAL PRESSURE DATA	
ID#	- 1-FC-V021	ID#	- 1-FC-FV-F045	NORMAL OPEN	- 1125 PSI
MANUFACTURER	- ANCHOR/DARLING	MANUFACTURER	- LIMITORQUE	NORMAL CLOSE	- 1125 PSI
TYPE	- GLOBE	MODEL	- SMB-0	ABNORMAL OPEN	- 1375 PSI
SIZE	- 4"	MOTOR PPM	- 1900	ABNORMAL CLOSE	- 1375 PSI
RATING	- 900 LB.	OUTPUT SPEED	- 10 SECONDS	TORQUE SET/OPEN	- 2.25
				TORQUE SET/CLOSE	- 2.25

TABLE 1 (CONTINUED)

4. PUMP DISCHARGE ISOLATION:

VALVE		VALVE OPERATOR		DIFFERENTIAL PRESSURE DATA	
ID#	- 1-BD-V011	ID#	- 1-BD-HV-F012	NORMAL OPEN	- 1140 PSI
MANUFACTURER	- ANCHOR/DARLING	MANUFACTURER	- LIMITORQUE	NORMAL CLOSE	- 1140 PSI
TYPE	- GATE	MODEL	- SMB-0	ABNORMAL OPEN	- 1375 PSI
SIZE	- 6"	MOTOR PPM	- 1900	ABNORMAL CLOSE	- 1375 PSI
RATING	- 900 LB.	OUTPUT SPEED	- 10 SECONDS	TORQUE SET/OPEN	- 2.0
				TORQUE SET/CLOSE	- 2.0

5. INJECTION:

VALVE		VALVE OPERATOR		DIFFERENTIAL PRESSURE DATA	
ID#	- 1-BD-V005	ID#	- 1-BD-HV-F013	NORMAL OPEN	- 1140 PSI
MANUFACTURER	- ANCHOR/DARLING	MANUFACTURER	- LIMITORQUE	NORMAL CLOSE	- 1140 PSI
TYPE	- GATE	MODEL	- SMB-0	ABNORMAL OPEN	- 1375 PSI
SIZE	- 6"	MOTOR PPM	- 1900	ABNORMAL CLOSE	- 1375 PSI
RATING	- 900 LB.	OUTPUT SPEED	- 10 SECONDS	TORQUE SET/OPEN	- 2.75
				TORQUE SET/CLOSE	- 2.5

TABLE 1 (CONTINUED)
HIGH PRESSURE COOLANT INJECTION

1. TURBINE INLET ISOLATION:

VALVE		VALVE OPERATOR		DIFFERENTIAL PRESSURE DATA	
ID#	- 1-FD-V003	ID#	- 1-FD-HV-F007	NORMAL OPEN	- 1135 PSI
MANUFACTURER	- ANCHOR/DARLING	MANUFACTURER	- LIMITORQUE	NORMAL CLOSE	- 1135 PSI
TYPE	- GATE	MODEL	- SMB-1	ABNORMAL OPEN	- 1210 PSI
SIZE	- 10"	MOTOR PPM	- 1900	ABNORMAL CLOSE	- 1210 PSI
RATING	- 900 LB.	OUTPUT SPEED	- 15 SECONDS	TORQUE SET/OPEN	- 1.5
				TORQUE SET/CLOSE	- 1.5

2. INJECTION TO CORE SPRAY:

VALVE		VALVE OPERATOR		DIFFERENTIAL PRESSURE DATA	
ID#	- 1-BJ-V001	ID#	- 1-BJ-HV-F006	NORMAL OPEN	- 1230 PSI
MANUFACTURER	- ANCHOR/DARLING	MANUFACTURER	- LIMITORQUE	NORMAL CLOSE	- 1230 PSI
TYPE	- GATE	MODEL	- SB-3	ABNORMAL OPEN	- 1375 PSI
SIZE	- 14"	MOTOR PPM	- 1900	ABNORMAL CLOSE	- 1375 PSI
RATING	- 900 LB.	OUTPUT SPEED	- 16 SECONDS	TORQUE SET/OPEN	- 2.75
				TORQUE SET/CLOSE	- 2.75

3. PUMP DISCHARGE ISOLATION:

VALVE		VALVE OPERATOR		DIFFERENTIAL PRESSURE DATA	
ID#	- 1-BJ-V002	ID#	- 1-BJ-HV-F007	NORMAL OPEN	- 1230 PSI
MANUFACTURER	- ANCHOR/DARLING	MANUFACTURER	- LIMITORQUE	NORMAL CLOSE	- 1230 PSI
TYPE	- GATE	MODEL	- SB-3	ABNORMAL OPEN	- 1375 PSI
SIZE	- 14"	MOTOR PPM	- 1900	ABNORMAL CLOSE	- 1375 PSI
RATING	- 900 LB.	OUTPUT SPEED	- 16 SECONDS	TORQUE SET/OPEN	- 1.5
				TORQUE SET/CLOSE	- 1.5

4. INJECTION TO FEEDWATER:

VALVE		VALVE OPERATOR		DIFFERENTIAL PRESSURE DATA	
ID#	- 1-FD-V059	ID#	- 1-BJ-HV-8278	NORMAL OPEN	- 1230 PSI
MANUFACTURER	- ANCHOR/DARLING	MANUFACTURER	- LIMITORQUE	NORMAL CLOSE	- 1230 PSI
TYPE	- GATE	MODEL	- SMB-0	ABNORMAL OPEN	- 1375 PSI
SIZE	- 8"	MOTOR PPM	- 1900	ABNORMAL CLOSE	- 1375 PSI
RATING	- 900 LB.	OUTPUT SPEED	- 37 SECONDS	TORQUE SET/OPEN	- 2.25
				TORQUE SET/CLOSE	- 2.5

TABLE 1 (CONTINUED)

5. STEAM LINE INBOARD ISOLATION:

VALVE

ID#	- 1-FD-V001
MANUFACTURER	- ANCHOR/DARLING
TYPE	- GATE
SIZE	- 10"
RATING	- 900 LB.

VALVE OPERATOR

ID#	- 1-FD-HV-F002
MANUFACTURER	- LIMITORQUE
MODEL	- SMB-1
MOTOR PPM	- 1700
OUTPUT SPEED	- 35 SECONDS

DIFFERENTIAL PRESSURE DATA

NORMAL OPEN	- 0 PSI
NORMAL CLOSE	- 1120 PSI
ABNORMAL OPEN	- 1315 PSI
ABNORMAL CLOSE	- 1315 PSI
TORQUE SET/OPEN	- 3.0
TORQUE SET/CLOSE	- 3.0

6. STEAM LINE OUTBOARD ISOLATION:

VALVE

ID#	- 1-FD-V002
MANUFACTURER	- ANCHOR/DARLING
TYPE	- GATE
SIZE	- 10"
RATING	- 900 LB.

VALVE OPERATOR

ID#	- 1-FD-HV-F003
MANUFACTURER	- LIMITORQUE
MODEL	- SMB-1
MOTOR PPM	- 1700
OUTPUT SPEED	- 35 SECONDS

DIFFERENTIAL PRESSURE DATA

NORMAL OPEN	- 0 PSI
NORMAL CLOSE	- 1120 PSI
ABNORMAL OPEN	- 1315 PSI
ABNORMAL CLOSE	- 1315 PSI
TORQUE SET/OPEN	- 2.625
TORQUE SET/CLOSE	- 2.75

7. MINIMUM FLOW BYPASS:

VALVE

ID#	- 1-BJ-V016
MANUFACTURER	- ANCHOR/DARLING
TYPE	- GLOBE
SIZE	- 4"
RATING	- 900 LB.

VALVE OPERATOR

ID#	- 1-BJ-HV-F012
MANUFACTURER	- LIMITORQUE
MODEL	- SMB-0
MOTOR PPM	- 1900
OUTPUT SPEED	- 7 SECONDS

DIFFERENTIAL PRESSURE DATA

NORMAL OPEN	- 1230 PSI
NORMAL CLOSE	- 1230 PSI
ABNORMAL OPEN	- 1375 PSI
ABNORMAL CLOSE	- 1375 PSI
TORQUE SET/OPEN	- 2.75
TORQUE SET/CLOSE	- 2.75