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Executive Department

Georgia Power
the southern electric system

SL-4431c
1995C
X7GJ17-H110

May 4, 1988

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

PLANT HATCH - UNITS 1, 2
NRC DOCKETS 50-321, 50-366
OPERATING LICENSES DPR-57, NPF-5
REQUEST FOR ADDITIONAL INFORMATION ON
IE BULLETIN 85-03

Gentlemen:

By letters dated October 2, 1986, and March 12, 1987, Georgia Power Company (GPC) submitted its response to IE Bulletin (IEB) 85-03, "Motor-Operated Valve Common Mode Failures During Plant Transients Due to Improper Switch Settings," for Plant Hatch Units 1 and 2. On April 4, 1988, the NRC transmitted a request for additional information (RFAI) on GPC's IEB 85-03 program. Our responses are contained in Enclosure 1, and a detailed program description is contained in Enclosure 2.

During the recently completed Unit 2 Refueling/Maintenance outage, GPC completed static MOV testing on all the applicable High Pressure Coolant Injection (HPCI) and Reactor Core Isolation Cooling (RCIC) valves. (High delta pressure tests are planned.) Per the bulletin requirements, GPC had planned to submit a written request within 60 days of completion of the Unit 2 program. However, as a result of the RFAI, GPC is providing this interim submittal. In addition, GPC would like to schedule a meeting with appropriate NRC and Region II personnel to discuss the details of our program. As you know, we have elected to use a Motor Actuator Characterizer (MAC) system from Limitorque for signature analysis rather than the Motor-Operated Valve Actuation Testing System (MOVATS). Additionally the torque switch settings have been determined utilizing the Limitorque valve equations. GPC realizes that the NRC may be more familiar with MOVATS, and a discussion of our experience with the Limitorque equipment and methodology can be included in the meeting agenda.

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Georgia Power

We hope the enclosed material will be helpful in your review. You may contact this office if you have questions.

Sincerely,

R. P. McDonald
Executive Vice President
Nuclear Operations

GKM/ac/lc

Enclosures:
1. Response to RFAI on IE Bulletin 85-03.
2. IE Bulletin 85-03 Program Description.

c: <u>Georgia Power Company</u>
Mr. J. T. Beckham, Jr., Vice President - Plant Hatch
Mr. L. T. Gucwa, Manager Nuclear Safety and Licensing
GO-NORMS

<u>U.S. Nuclear Regulatory Commission, Washington, D.C.</u>
Mr. L. P. Crocker, Licensing Project Manager - Hatch

<u>U.S. Nuclear Regulatory Commission, Region II</u>
Dr. J. N. Grace, Regional Administrator
Mr. P. Holmes-Ray, Senior Resident Inspector - Hatch

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Georgia Power

ENCLOSURE 1

PLANT HATCH - UNITS 1, 2
NRC DOCKETS 50-321, 50-366
OPERATING LICENSES DPR-57, NPF-5
RESPONSE TO REQUEST FOR ADDITIONAL
INFORMATION (RFAI) - IE BULLETIN 85-03

The following is a response to the NRC request for additional information on IEB 85-03 (Alan R. Herdt to George F. Head) dated April 4, 1988.

Question 1:

Revise the summary tables of the response dated March 12, 1987, to include values of differential pressures for opening the following MOVs, or justify exclusion of these pressures. As required by Action Item "a" of the bulletin, assume inadvertent equipment operations.

(a) HPCI MOV F004 is shown normally open in Zone D-9 of Drawing H-16332, Revision 21, and as MOV 3 on Page 68 of BWROG Report NEDC-31322 dated September 1986. How would suction from the CST be ensured if this MOV were to be (a) actuated inadvertently to the closed position upon intended initiation of the system or (b) left closed inadvertently?

(b) RCIC MOV F010 is shown normally open in Zone D-9 of Drawing H-16334, Revision 16, and as MOV 3 on Page 72 of the BWROG Report. The question in Item 1(a) above applies here also.

(c) HPCI MOV F007 is shown normally open in Zone E-5 of Drawing H-16332, Revision 21, and as MOV 8 on Page 68 of the BWROG Report. How would discharge to the reactor vessel be ensured if this MOV were to be (a) actuated inadvertently to the closed position upon intended initiation of the system or (b) left closed inadvertently?

(d) RCIC MOV F012 is shown normally open in Zone E-6 of Drawing H-16334, Revision 16, and as MOV 8 on Page 72 of the BWROG Report. The question in Item 1(c) above applies here also.

Response to Question 1:

The differential pressure calculations for the four valves which consider valve mispositioning errors are not available to provide to the NRC at this time. The BWR Owner's Group (BWROG) report (Reference 1) concluded that the inadvertent valve operation information was beyond the design basis of the plant. As such, the BWROG methodology for calculation of differential pressure was not developed. If required, Georgia Power Company would use this methodology to calculate the Hatch-specific differential pressure as we did for the valves in our March 12, 1987, submittal.

We understand that the question of whether or not valve mispositioning should be considered under this program is still under discussion and that a revision to IEB 85-03 may be issued shortly. Although GPC may elect to follow the BWROG "position" delineated in the Reference 2 letter, we strongly disagree with any precedent which causes us to consider events beyond the plant design basis in this IEB 85-03 program.

Question 2:

Revise the RCIC summary table of the response dated March 12, 1987, to include Trip and Throttle Valve F524 leading to the RCIC Turbine, or justify its exclusion. This MOV is shown in Zone D-3 of Drawing H-16335, Revision 11 for Unit 1, and as MOV X on Page 74 of the BWROG Report. Is this MOV meant to be identified with a number in Zone C-9 of Drawing H-26024, Revision 13 for Unit 2? Assume inadvertent equipment operations, as described in Item 1 above.

Response to Question 2:

Valve number X in Reference 1 functions as the RCIC turbine trip and throttle valve. The active safety function of the RCIC turbine trip and throttle valve is to trip closed when required to protect the turbine and pump. The closure of the valve, when tripped, is spring actuated. The motor operator on this valve is only used to reset the valve to the open position following a turbine trip.

The differential pressure across the RCIC turbine trip and throttle valve during opening is negligible. The basis for this is that, prior to resetting the RCIC turbine trip and throttle valve, the RCIC system steam admission valve located upstream of the trip and throttle valve would first be closed. This action resets the RCIC system startup logic (i.e., the ramp generator for the RCIC turbine). The RCIC turbine trip and throttle valve above the seat drain upstream of the valve will vent steam that is trapped between the closed steam admission valve and the trip and throttle valve to the turbine exhaust line drain pot. This will reduce the differential pressure across the turbine trip and throttle valve to a negligible value prior to valve opening.

Unit 2 drawing H-26024 does not show the master part list (MPL) number for MOV X and will be corrected.

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ENCLOSURE 1 (Continued)
RESPONSE TO RFAI - IE BULLETIN 85-03

Question 3:

Revise the summary tables of the response dated March 12, 1987, to include values of differential pressure for opening and closing the following MOVs, or justify exclusion of these pressures. According to Pages 55 and 59 of the BWROG Report, these CST test return valves have no safety action; however, utilities are expected to report differential pressures for testing, per Note "o" on Page 66.

(a) HPCI MOVs F008 and F011 are shown normally closed as MOVs 5 and 6 on Page 68 of the BWROG Report.

(b) RCIC MOV F022 is shown normally closed as MOV 5 on Page 72 of the BWROG Report.

Response to Question 3:

The plant design basis evaluations for transient and accident responses analyzed in the FSAR assume the HPCI and RCIC systems are in their normal standby condition at the start of the event. This assumption is made because of the low probability of the system being in a test mode or out of service during the occurrence of an abnormal event. Based on this assumption, the HPCI MOVs F008 and F011 and the RCIC MOV F022 perform no active safety function during FSAR design basis events. These valves would not be included as part of GPC's IEB 85-03 program, especially since they are not among the nine valves of question relative to the mispositioning issue. (See response to Question 1.) Nevertheless, the Unit 2 summary tables from the March 12, 1987, submittal have been revised to include these calculations and appear at the end of this enclosure. Unit 1 results will be similar and will be available at a later date. It should be noted that operation of these valves during system flow tests demonstrates their capability to operate against differential pressures that occur during testing.

Question 4:

The proposed program for action items b, c and d of the bulletin is incomplete. Provide the following details as a minimum:

(a) commitment to justify continued operations of a valve determined to be inoperable,

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ENCLOSURE 1 (Continued)
RESPONSE TO RFAI - IE BULLETIN 85-03

(b) description of a method possibly needed to extrapolate valve stem thrust determined by testing at less than maximum differential pressure,

(c) justification of a possible alternative to testing at maximum differential pressure at the plant.

(d) consideration of pipe break conditions as required by the bulletin, and

(e) description of program for selection of switch settings (i.e., torque bypass, position limit, overload) for valve operation.

Response to Question 4:

(a) Much of the static MOV testing of the HPCI and RCIC valves was performed during the Unit 2 Refueling/Maintenance outage and similar testing is planned for Unit 1 during the Fall 1988 outage. During the outage, HPCI and RCIC would not be required; therefore the valve could be instrumented and tested in the as-found condition and set up within IEB 85-03 program specifications without having to enter a limiting condition for operation (LCO) for the applicable system. For bulletin valves tested prior to shutdown (or for selected valves which will be tested at high differential pressure), the HPCI or RCIC system was (will be) declared inoperable and the LCO entered. The valve was (will be) adjusted, if necessary, so the as-left condition was within program specifications and the system returned to service. In the very unlikely event that the valve could not be made operable within the allowable outage time (AOT), GPC would probably pursue alternate paths of justifying continued operation (i.e., by analysis, repair, or replacement). If these efforts were unsuccessful and the LCO expired, appropriate actions per Technical Specifications would be taken.

(b) See Enclosure 2.

(c) See Enclosure 2.

(d) Consideration of pipe break conditions was included in the differential pressure calculations reported in our NRC submittals. They were also factored in the establishment of permissible torque and thrust settings. (See Enclosure 2.) Georgia Power has no plans

ENCLOSURE 1 (Continued)
RESPONSE TO RFAI - IE BULLETIN 85-03

to test these valves at full differential pressure, but will perform a static MOV test and adjust the required settings per the Limitorque equations relative to the maximum differential pressure expected during accident conditions.

(e) See Enclosure 2.

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ENCLOSURE 1 (Continued)
RESPONSE TO RFAI - IE BULLETIN 85-03

REFERENCES:

1. NEDC-31322, "BWR Owners Group Report on the Operational Design Basis of Selected Safety-Related Motor Operated Valves," September, 1986.

2. Letter, R. F. Janecek (BWROG) to J. H. Sniezek (NRC), same subject, dated March 28, 1988.

DESIGN CALCULATIONS
E.I. HATCH NUCLEAR PLANT UNIT 2
UNIT 2 HPCI MOTOR OPERATED VALVE
DIFFERENTIAL PRESSURE CALCULATION

SOUTHERN COMPANY SERVICES
PREPARED BY: E. B. Hawkins DATE 12/18/86
REVIEWED BY: C. Brown DATE 12/18/86
CALCULATION NUMBER SNH-86-017 SHEET 6 OF 54
SUMMARY TABLE 12/17/86

MPL NUMBER	VALVE DESCRIPTION	VALVE FUNCTION	SAFETY	DP CALCULATION FORMULA	MAXIMUM DP	MAXIMUM DP	DP (PSID)	SAFETY
2E41-F001	TURBINE STEAM SUPPLY VALVE	HPCI TURBINE STEAM ADMISSION VALVE	OPEN	DP=PRSS	OPEN	UPSTREAM	1090	YES
2E41-F002	STEAM SUPPLY INBOARD ISOL VALVE	HPCI STEAM LINE ISOLATION VALVE	CLOSE	DP=PRSS	CLOSE	UPSTREAM	1090	YES
2E41-F003	STEAM SUPPLY OUTBD ISOL VALVE	HPCI STEAM LINE ISOLATION VALVE	CLOSE	DP=PRSS	CLOSE	UPSTREAM	1090	YES
2E41-F004	PUMP SUCT FRM COND STOR TANK	HPCI CST SUCTION VALVE	CLOSE	DP=PELD+PV+PVEL1	CLOSE	UPSTREAM	29.814	YES
2E41-F006	HPCI PUMP INBD DISCH VALVE	HPCI INJECTION/ISOLATION VALVE	OPEN/CLOSE	DP=PSDH-PISD-PEL	OPEN	UPSTREAM	418.73	YES
2E41-F006	HPCI PUMP INBD DISCH VALVE	HPCI INJECTION/ISOLATION VALVE	OPEN/CLOSE	DP=PSDH-PISD-PEL+PVEL2	CLOSE	UPSTREAM	426.893	YES
2E41-F007	HPCI PUMP OUTBD DISCH VALVE	HPCI INJECTION VALVE TEST VALVE	NONE	NO SAFETY ACTION	N/A	N/A	N/A	NO
2E41-F008	TEST BYPASS VALVE TO COND STOR	HPCI CST TEST RETURN VALVE	NONE	NO SAFETY ACTION	Close	Upstream	1254.14	NO
2E41-F011	REDUNDANT SHUTOFF W/F008	HPCI CST TEST RETURN VALVE	NONE	NO SAFETY ACTION	Close	Upstream	1258.31	NO
2E41-F012	PMP MIN FLO BYP TO SUPP POOL	HPCI PUMP MIN FLO BYP ISOL VALVE	OPEN/CLOSE	DP=PSDH+PELM	OPEN	UPSTREAM	1309.28	YES
2E41-F012	PMP MIN FLO BYP TO SUPP POOL	HPCI PUMP MIN FLO BYP ISOL VALVE	OPEN/CLOSE	DP=PMF+PELM+PVEL3	CLOSE	UPSTREAM	1315.305	YES
2E41-F041	PMP SUCT FROM SUPP POOL	HPCI SUPP POOL SUCT ISOL VALVE	OPEN/CLOSE	DP=PRV-PELS	OPEN	DOWNSTREAM	97.12	YES
2E41-F041	PMP SUCT FROM SUPP POOL	HPCI SUPP POOL SUCT ISOL VALVE	OPEN/CLOSE	DP=PLOC+PLOM1	CLOSE	UPSTREAM	37.06	YES
2E41-F042	PMP SUCT FROM SUPP POOL	HPCI SUPP POOL SUCT ISOL VALVE	OPEN/CLOSE	DP=PRV-PELS	OPEN	DOWNSTREAM	97.12	YES
2E41-F042	PMP SUCT FROM SUPP POOL	HPCI SUPP POOL SUCT ISOL VALVE	OPEN/CLOSE	DP=PLOC+PLOM1	CLOSE	UPSTREAM	37.06	YES
2E41-F059	COOLING WATER SUPPLY VALVE	HPCI TURBINE ACCES COOLING WTR VLV	OPEN/CLOSE	DP=PC+PLOM2	OPEN	UPSTREAM	37.01	YES
2E41-F059	COOLING WATER SUPPLY VALVE	HPCI TURBINE ACCES COOLING WTR VLV	OPEN/CLOSE	DP=PC+PLOM2+PVEL4	CLOSE	UPSTREAM	37.947	YES
2E41-F104	GATE VALVE 2 IN MO	HPCI VAC BREAKER LINE ISOL VALVE	CLOSE	DP=PC+PATM	CLOSE	UPSTREAM	31.6	YES
2E41-F111	GATE VALVE 2 IN MO	HPCI VAC BREAKER LINE ISOL VALVE	CLOSE	DP=PC+PATM	CLOSE	UPSTREAM	31.6	YES

DESIGN CALCULATIONS
E.I. HATCH NUCLEAR PLANT UNIT 2
UNIT 2 RCIC MOTOR OPERATED VALVE
DIFFERENTIAL PRESSURE CALCULATION

PREPARED BY: C. Soren
REVIEWED BY: B. Hutson
CALCULATION NUMBER SNH-86-018

SOUTHERN COMPANY SERVICES
DATE 09/21/86
DATE 09/21/86
SHEET 1 OF 52.

SUMMARY TABLE 09/21/86

MPL NUMBER	VALVE DESCRIPTION	VALVE FUNCTION	SAFETY	DP CALCULATION FORMULA	MAXIMUM DP	MAXIMUM DP	DP (PSID)	SAFETY
2E51-F007	RCIC STEAM INBOARD ISOL VALVE	RCIC STEAM LINE ISOLATION VALVE	CLOSE	DP=PRSS	CLOSE	UPSTREAM	1090	YES
2E51-F008	RCIC STEAM OUTBOARD ISOL VLV	RCIC STEAM LINE ISOLATION VALVE	CLOSE	DP=PRSS	CLOSE	UPSTREAM	1090	YES
2E51-F010	PUMP SUCT FRM COND STG TNK	RCIC CST SUCTION ISOLATION VALVE	CLOSE	DP=PELD+PV+PVEL1	CLOSE	UPSTREAM	29.6217	YES
2E51-F012	RCIC PUMP OUTBOARD DISCH VLV	RCIC INJECTION VALVE TEST VALVE	NONE	NO SAFETY ACTION	N/A	N/A	N/A	NO
2E51-F013	RCIC PUMP INBOARD DISCH VLV	RCIC INJECTION VALVE	OPEN/CLOSE	DP=PRSS+PEL	OPEN/CLOSE	DOWNSTREAM	1125.612	YES
2E51-F019	TEST BYPASS TO COND STG TANK	RCIC MINIMUM FLOW BYPASS ISOL VALVE	OPEN/CLOSE	DP=PSOH+PELM	OPEN	UPSTREAM	1330.173	YES
2E51-F019	TEST BYPASS TO COND STG TANK	RCIC MINIMUM FLOW BYPASS ISOL VALVE	OPEN/CLOSE	DP=PMF+PELM+PVEL3	CLOSE	UPSTREAM	1333.883641	YES
2E51-F022	TEST BYPASS TO COND STG TANK	RCIC CST TEST RETURN VALVE	NONE	NO SAFETY ACTION	CLOSE	UPSTREAM	128.103	NO
2E51-F029	RCIC PMP SUCT VLV FRM SUP POOL	RCIC SUPP POOL SUCTION ISOL VALVE	OPEN/CLOSE	DP=PRV-PELS	OPEN	DOWNSTREAM	95.6	YES
2E51-F029	RCIC PMP SUCT VLV FRM SUP POOL	RCIC SUPP POOL SUCTION ISOL VALVE	OPEN/CLOSE	DP=PLOC+PLOM1	CLOSE	UPSTREAM	37.317	YES
2E51-F031	RCIC PMP SUCT VLV FRM SUP POOL	RCIC SUPP POOL SUCTION ISOL VALVE	OPEN/CLOSE	DP=PRV-PELS	OPEN	DOWNSTREAM	95.6	YES
2E51-F031	RCIC PMP SUCT VLV FRM SUP POOL	RCIC SUPP POOL SUCTION ISOL VALVE	OPEN/CLOSE	DP=PLOC+PLOM1	CLOSE	UPSTREAM	37.317	YES
2E51-F045	TURBINE STEAM SUPPLY VALVE	RCIC STEAM ADMISSION VALVE	OPEN/CLOSE	DP=PRSS	OPEN/CLOSE	UPSTREAM	1090	YES
2E51-F046	COOLING WATER SUPPLY VALVE	RCIC TURBINE ACCESSORY COOL WTR VALVE	OPEN/CLOSE	DP=PSOI+PELC	OPEN	UPSTREAM	291.974	YES
2E51-F046	COOLING WATER SUPPLY VALVE	RCIC TURBINE ACCESSORY COOL WTR VALVE	OPEN/CLOSE	DP=PLOC+PLOM2+PVEL4	CLOSE	UPSTREAM	37.381729	YES
2E51-F104	GATE VALVE 1.5 IN MO	RCIC VACUUM BREAKER LINE ISOL VALVE	CLOSE	DP=PC+PATM	CLOSE	UPSTREAM	31.6	YES
2E51-F105	GATE VALVE 2 IN MO	RCIC VACUUM BREAKER LINE ISOL VALVE	CLOSE	DP=PC+PATM	CLOSE	UPSTREAM	31.6	YES
2E51-F119	LSTB VALVE	RCIC STEAM ADMISSION BYPASS VALVE	CLOSE	DP=PRSS	CLOSE	UPSTREAM	1090	YES

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ENCLOSURE 2

PLANT HATCH - UNITS 1, 2
NRC DOCKETS 50-321, 50-366
OPERATING LICENSES DPR-57, NPF-5
IE BULLETIN 85-03 PROGRAM DESCRIPTION

Introduction

IE Bulletin 85-03 addresses potential problems associated with switch settings on certain safety-related motor-operated valves. The bulletin was issued in response to several events at operating nuclear plants in which safety-related valves failed to operate due to improper switch settings. The bulletin requests each plant to implement a program to set and maintain certain MOV switches to ensure valve operability under maximum differential pressure conditions.

The program developed for Plant Hatch can basically be divided into four sections which correspond to Action Items a, b, c, and d of the Bulletin. These sections include the following:

1. Identification of Valves and Determination of Maximum Differential Pressure.

2. Establishment of Correct Switch Settings.

3. Switch Adjustment and Demonstration of Operability at Maximum Differential Pressure.

4. Development of Procedures to Ensure that Switch Settings are Maintained for the Life of the Plant.

Each section of the program, along with its current status, is outlined below.

I. Identification of Valves and Determination of Maximum Differential Pressure

The Hatch response to Action Item "a" is based on the "BWR Owners Group Report on the Operational Design Basis of Selected Safety-Related Motor-Operated Valves." This report identified the BWR valves covered by the bulletin and outlined a methodology for calculating the maximum differential pressure for each valve. For Plant Hatch, the bulletin covers a total of 22 valves on Unit 1 and 23 valves on Unit 2, all contained within the HPCI and RCIC systems.

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ENCLOSURE 2 (Continued)
IE BULLETIN 85-03 PROGRAM DESCRIPTION

This section of the program has been completed, and an initial submittal identifying the bulletin valves and their maximum differential pressure was transmitted to the NRC on October 2, 1986. This submittal was subsequently amended on March 12, 1987, to revise the maximum differential pressure for certain valves.

II. Establishment of Correct Switch Settings

This section of the program can be divided into three parts, including: A. Switch Functional Review, B. Calculation of Required Opening and Closing Thrust, and C. Engineering Evaluation of Operator Capability.

A. Switch Functional Review

The elementary wiring diagrams for each of the valves was reviewed to determine the design function of each of the switches contained in the Limitorque operator. In addition, the applicable maintenance procedures were reviewed to determine the current method for setting each of the switches. The results of this review are summarized below.

1. Open Torque Switch - This switch is not utilized in the control circuit of any bulletin valves.

2. Close-to-Open Torque Bypass Switch - This switch is not required because the open torque switch is not utilized in the control circuits of any bulletin valves.

3. Open Limit Switch - This switch is utilized to trip the operator in the opening direction. The switch is adjusted to ensure that inadvertent backseating due to inertia does not occur.

4. Close Torque Switch - This switch is utilized to trip the operator in the closing direction. The switch setting is currently based on manufacturer recommendations.

5. Open-to-Close Torque Bypass Switch - This switch is utilized to bypass the close torque switch during the initial 1/8 in. of travel in the closing direction.

ENCLOSURE 2 (Continued)
IE BULLETIN 85-03 PROGRAM DESCRIPTION

6. Close Limit Switch - This switch is not utilized in the control circuit of any bulletin valves.

7. Motor Overloads - The motor overloads are jumpered out during normal plant operation on all bulletin valves. The motor overloads are in service only during routine surveillance and post maintenance testing.

The switch functional review indicated that the design philosophy of the operator trip scenario was sound and that it afforded the valve the maximum opportunity to perform its intended function. The significant switches, with regard to valve operability, are the open limit switch and the close torque and torque bypass switches. The setpoints for the open limit switch and the close torque switch are delineated in the applicable maintenance procedures. The close torque switch settings are currently based on information provided by the valve and operator manufacturers and are in terms of switch position rather than engineering units.

In order to evaluate the adequacy of the torque switch settings and operator sizing, it was necessary to know the minimum required thrust to open and close each valve under the maximum differential pressure. Standard Limitorque equations were used to revalidate the sizing and settings for full differential pressure. Although documentation on the valve and operator manufacturers' original torque switch setpoints was available, the detailed engineering calculations sometimes were more difficult to locate. In addition, the original thrust calculations were based on system design pressures rather than the actual expected maximum differential pressures. It was determined that the required thrusts to open and close each valve under its maximum differential pressure should be recalculated to verify operator sizing and torque switch setpoints.

B. Calculation of Required Opening and Closing Thrust

In order to calculate the required opening and closing thrusts, it was necessary to obtain data on the physical characteristics of the valves. This information was not always available on drawings or in vendor manuals and required going back to the original equipment manufacturer. Each valve vendor was contacted and requested to provide the following information:

- Seat ring diameter.
- Disk or plug coefficient of friction.
- Stem efficiency.
- Stem diameter, pitch, and lead.
- Maximum allowable torque.

These data were used to calculate the required opening and closing thrusts for each valve. These calculations were performed utilizing the standard Limitorque empirical equations for gate and globe valves. These calculations provide the minimum required thrusts to open and close each valve. The next step was to perform an engineering evaluation to determine whether each operator was capable of providing the required thrust.

C. Engineering Evaluation of Operator Capability

A complete review of the Limitorque operator for each valve was performed to determine the maximum torque rating of each operator. This included a review of operator capability at derated voltage (90-percent voltage for AC and 84-percent voltage for DC). This review verified that the original operator setting was sufficient to operate the valves against the maximum differential pressure and also established an upper limit above which the valve or operator could sustain mechanical damage.

With this section of the program complete, information became available regarding the minimum torque required to open and close each valve and the maximum allowable torque to avoid damage to the valve or operator. This information (in the form of "target" ranges of permissible torque and thrust) has been utilized to evaluate switch settings in the field and to adjust switches, as required to ensure operation at maximum differential pressure without damage to the valve or operator. Table 1 contains a summary of the MOV calculations for Unit 2. Calculations for Unit 1 will be available at a later date.

III. <u>Switch Adjustment and Demonstrate Operability at Maximum Differential Pressure</u>

This section of the program can be divided into three parts, including: A. MOV Diagnostic Testing, B. Signature Analysis, and C. Differential Pressure Testing.

ENCLOSURE 2 (Continued)
IE BULLETIN 85-03 PROGRAM DESCRIPTION

A. MOV Diagnostic Testing on Unit 2

In order to verify the operability of each valve, the Limitorque Motor Actuator Characterizer (MAC) was utilized. This system allows the following parameters to be monitored and recorded during the respective closing or opening stroke of the valve:

- Stem thrust.
- Output torque.
- Motor current.
- Spring pack displacement.
- Open torque switch.
- Open torque switch bypass.
- Open limit switch.
- Close torque switch.
- Close torque switch bypass.
- Close limit switch.

Valve signatures were taken in the as-found condition in accordance with procedures. These data were evaluated in conjunction with the calculated data in Section II. If an adjustment was required, a new set of signatures was taken to verify that the settings were correct and to provide a record of the as-left condition.

B. Signature Analysis

The static signatures taken with the MAC equipment were analyzed to evaluate each valve's operability at maximum differential pressure. The static signatures quantified all valve loads other than those due to differential pressure in terms of thrust and/or torque. In addition, the status of the torque and limit switches was monitored with respect to time and was directly related to thrust and torque at the switch trip points. By comparing the thrust at the torque switch trip point to the calculated required thrusts to open and close the valve, a determination of valve operability at maximum differential pressure was made. If the thrust at the torque switch trip point was determined to be greater than the required opening and closing thrust, the valve will be capable of operating against the maximum differential pressure.

ENCLOSURE 2 (Continued)
IE BULLETIN 85-03 PROGRAM DESCRIPTION

C. Differential Pressure Testing

A differential pressure test will be conducted on the steam admission valves (2E41-F001 and 2E51-F045) of the Unit 2 HPCI and RCIC systems. Unit 1 testing will be completed at a later date. The purpose of these tests will be to help validate the methodology outlined in Section III.B for determining valve operability at maximum differential pressure. The steam admission valves were chosen due to their accessibility, high differential pressure, and the fact that these valves are stroked during system operability tests.

Each of the above valves will be outfitted with the MAC diagnostic equipment and stroked during a system operability test. The data obtained during this test will be evaluated in conjunction with the calculated thrust values to ensure that the Limitorque equations are providing sufficiently conservative results.

IV. Development of Procedures to Ensure that Switch Settings are Maintained for the Life of the Plant

Existing plant procedures are presently being reviewed to identify changes necessary to ensure that switch settings are maintained for the life of the plant. A policy regarding periodic and/or maintenance-related retesting will have to be formulated prior to identifying all procedural requirements. This policy and the procedural changes necessary to implement it will be initiated prior to making our final submittal.

Enclosure 2 (continued)

TABLE 1

UNIT 2 MOV SUMMARY OF CONCLUSIONS

VALVE MPL	VALVE DESCRIPTION	RATED MOTOR TORQUE (FTLB)	REQD MOTOR TORQUE (FTLB)	REQD MTR TORQUE DERATED (FTLB)	TARGET TORQUE RANGE MINIMUM (FTLB)	TARGET TORQUE RANGE MAXIMUM (FTLB)	TARGET THRUST RANGE MINIMUM (LB)	TARGET THRUST RANGE MAXIMUM (LB)	LIMITING PARAMETER FOR UPPER TARGET LIMIT
2E41-F001	TURBINE STEAM SUPPLY	60	48.18	57.36	471.76	652.80	23843	32992	OPER MAX AVAIL TORQUE
2E41-F002	STEAM SUPPLY INBOARD ISOLATION	25	20.52	25.33	472.12	639.20	23860	32305	OPER MAX AVAIL TORQUE
2E41-F003	STEAM SUPPLY OUTBOARD ISOLATION	40	21.80	25.96	472.12	850.00	23860	42958	OPER MAX ALLOW TORQUE
2E41-F004	PUMP SUCTION CST	15	4.12	4.91	91.46	3[illegible]7.84	4137	16727	OPER MAX AVAIL TORQUE
2E41-F006	PUMP INBOARD DISCHARGE	150	35.36	42.10	498.76	2200.00	19703	86908	VALV MAX ALLOW TORQUE
2E41-F012	MIN FLOW BYPASS	25	7.39	8.79	123.[illegible]	342.30	8624	24000	OPER MAX ALLOW THRUST
2E41-F041	PUMP SUCTION FROM SUPPRESION POOL	15	8.27	9.85	173.16	348.78	7832	15775	OPER MAX AVAIL TORQUE
2E41-F042	PUMP SUCTION FROM SUPPRESION POOL	15	8.27	9.85	173.16	348.78	7832	15775	OPER MAX AVAIL TORQUE
2E41-F059	COOLING WATER SUPPLY	10	0.62	0.74	10.46	135.62	1080	14000	OPER MAX ALLOW THRUST
2E41-F104	VACUUM BREAKER ISOLATION	2	0.35	0.43	8.5[illegible]	54.93	1015	6537	OPER MAX AVAIL TORQUE
2E41-F111	VACUUM BREAKER ISOLATION	2	0.35	0.43	8.53	54.93	1015	6537	OPER MAX AVAIL TORQUE
2E51-F007	STEAM INBOARD ISOLATION	10	6.71	8.29	63.62	105.32	5618	9300	OPER MAX AVAIL TORQUE
2E51-F008	STEAM OUTBOARD ISOLATION	10	6.27	7.46	63.62	112.80	5618	9961	OPER MAX AVAIL TORQUE
2E51-F010	PUMP SUCTION CST	5	1.53	1.82	26.32	9[illegible].00	1751	5988	OPER MAX ALLOW TORQUE
2E51-F013	PUMP ISOLATION INBOARD	15	7.75	9.22	78.86	169.20	5752	12373	OPER MAX AVAIL TORQUE
2E51-F019	TEST BYPASS TO CST	25	5.44	6.48	37.23	135.62	3843	14000	OPER MAX ALLOW THRUST
2E51-F029	PUMP SUCTION SUPPRESSION POOL	5	2.21	2.63	34.74	87.50	2312	5822	OPER MAX AVAIL TORQUE
2E51-F031	PUMP SUCTION SUPPRESSION POOL	5	2.21	2.63	34.74	87.50	2312	5822	OPER MAX AVAIL TORQUE
2E51-F045	TURBINE STEAM SUPPLY	40	15.30	18.21	192.52	295.26	15649	24000	OPER MAX ALLOW THRUST
2E51-F046	COOLING WATER SUPPLY	10	1.40	1.67	23.58	135.62	2434	14000	OPER MAX ALLOW THRUST
2E51-F104	VACUUM BREAKER ISOLATION	2	0.36	0.44	7.31	45.60	1009	6293	OPER MAX AVAIL TORQUE
2E51-F105	VACUUM BREAKER ISOLATION	2	0.36	0.44	7.31	45.60	1009	6293	OPER MAX AVAIL TORQUE
2E51-F119	STEAM ADMISSION BYPASS	5	1.50	1.78	13.19	48.99	1625	6037	OPER MAX AVAIL TORQUE