CP&L
Carolina Power & Light Company
P.O. Box 1551 • Raleigh, N.C. 27602

SERIAL: NLS-91-186

JUL 29 1991

G. E. VAUGHN
Vice President
Nuclear Services Department

United States Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, DC 20555

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 & 50-324/LICENSE NOS. DPR-71 & DPR-62
RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION REGARDING CP&L RESPONSE TO NRC GENERIC LETTER 89-10, SUPPLEMENT 3
TAC NOS. 77768/77769

Gentlemen:

By letter dated June 25, 1991, the NRC issued a Request for Additional Information (RAI) regarding the Carolina Power & Light Company (CP&L) 120 day response to Generic Letter 89-10, Supplement 3. CP&L provided the 120 day response for the Brunswick Steam Electric Plant (BSEP) Unit Nos. 1 and 2 on March 20, 1991.

CP&L has completed its review of this RAI, and the requested information is provided in the enclosure to this letter. Please refer any questions regarding this submittal to Mr. M. R. Oates at (919) 546-6063.

Yours very truly,

G. E. Vaughn

GEV/JCP
Enclosure

cc: Mr. S. D. Ebneter
Mr. N. B. Le
Mr. R. L. Prevatte

G. E. Vaughn, having been first duly sworn, did depose and say that the information contained herein is true and correct to the best of his information, knowledge and belief; and the sources of his information are officers, employees, contractors, and agents of Carolina Power & Light Company.

Eleanor C. Chappell
Notary (Seal)

My commission expires: 2/6/96

ELEANOR C. CHAPPELL NOTARY PUBLIC WAKE COUNTY, N.C.

A064

ENCLOSURE 1

BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2
NRC DOCKETS 50-325 & 50-324
OPERATING LICENSES DPR-71 & DPR-62

RAI RESPONSE TO GL 89-10, SUPPLEMENT 3

QUESTION 1: Identify any modification (e.g. torque switch setting adjustments, gearing changes, or motor/actuator replacement) for each MOV within the scope of Supplement 3 to GL 89-10 since June 1990 or planned for the future.

RESPONSE: The following modifications have been implemented since June 1990, or are planned for the future:

1-E41-F002, HPCI Inboard Steamline Isolation Valve

The original flex wedge gate valve and the standard SMB-1 actuator for this MOV have been replaced since June 1990. Additionally, a logic change was implemented to bypass the close torque switch until the valve is approximately 96% closed. The current configuration is given below and no future modifications are planned.

Valve - 10", 900#, Anchor/Darling, Double Disk Gate
Actuator - SMB-1 Ball Screw Actuator
Unit Ratio - 97.81:1
Motor - 25 ft-lb, 3400 RPM, AC
Stem - 2-1/4" - 1/2P - 1/2L (Ball Screw)
Design Differential Pressure - 1136 PSID

1-E41-F003, HPCI Outboard Steamline Isolation Valve

The original flex wedge gate valve and the standard SMB-1 actuator for this MOV have been replaced since June 1990. Additionally, a logic change was implemented to bypass the close torque switch until the valve is approximately 96% closed. The current configuration is given below and no future modifications are planned.

Valve - 10", 900#, Anchor/Darling, Double Disk Gate
Actuator - SMB-1 Ball Screw Actuator
Unit Ratio - 50.39:1
Motor - 25 ft-lb, 1900 RPM, DC
Stem - 2-1/4" - 1/2P - 1/2L (Ball Screw)
Design Differential Pressure - 1136 PSID

1-E51-F007, RCIC Inboard Steamline Isolation Valve

The original flex wedge gate valve has been replaced since June 1990. Additionally, a logic change was implemented to bypass the close torque switch until the valve is approximately 96% closed. The current configuration is given below and no future modifications are planned.

Valve - 3", 900#, Anchor/Darling, Double Disk Gate
Actuator - SMB-00
Unit Ratio - 24.1:1
Motor - 5 ft-lb, 1700 RPM, AC
Stem - 3/4" - 1/4L - 1/4P
Design Differential Pressure - 1136 PSID

1-E51-F008, RCIC Outboard Steamline Isolation Valve

The original flex wedge gate valve has been replaced since June 1990. Additionally, a logic change was implemented to bypass the close torque switch until the valve is approximately 96% closed. The current configuration is given below and no future modifications are planned.

Valve - 3", 900#, Anchor/Darling, Double Disk Gate
Actuator - SMB-00
Unit Ratio - 38.6:1
Motor - 5 ft-lb, 1900 RPM, DC
Stem - 3/4" - 1/4P - 1/4L
Design Differential Pressure - 1136 PSID

1-G31-F001, RWCU Inlet Inboard Isolation Valve

The original flex wedge gate valve has been replaced since June 1990. Additionally, a logic change was implemented to bypass the close torque switch until the valve is approximately 96% closed. The current configuration is given below.

Valve - 6", 900#, Anchor/Darling, Double Disk Gate
Actuator - SMB-00
Unit Ratio - 72:1
Motor - 15 ft-lb, 1700 RPM, AC
Stem - 1-1/2" - 1/4P - 1/2L
Design Differential Pressure - 1150 PSID

1-G31-F004, RWCU Inlet Outboard Isolation Valve

The original flex wedge gate valve has been replaced since June 1990. Additionally, a logic change was implemented to bypass the close torque switch until the valve is approximately 96% closed. The current configuration is given below.

Valve - 6", 900#, Anchor/Darling, Double Disk Gate
Actuator - SMB-00
Unit Ratio - 77:1
Motor - 10 ft-lb, 1900 RPM, DC
Stem - 1-1/2" - 1/4P - 1/2L
Design Differential Pressure - 1150 PSID

2-E41-F002, HPCI Inboard Steamline Isolation Valve

This MOV has not been modified since June 1990. This MOV is currently planned to be modified to the same configuration as that given above for MOV 1-E41-F002 during the upcoming Fall 1991 refueling outage. The current configuration is given below.

Valve - 10", 600#, Anchor/Darling, Flex Wedge Gate
Actuator - SMB-1
Unit Ratio - 72.42:1
Motor - 25 ft-lb, 3400 RPM, AC
Stem - 1-7/8" - 1/4P - 1/2L
Design Differential Pressure - 1136 PSID

2-E41-F003, HPCI Outboard Steamline Isolation Valve

This MOV has not been modified since June 1990. This MOV is currently planned to be modified to the same configuration as that given above for MOV 1-E41-F003 during the upcoming Fall 1991 refueling outage. The current configuration is given below.

Valve - 10", 600#, Anchor/Darling, Flex Wedge Gate
Actuator - SMB-1
Unit Ratio - 77.25:1
Motor - 25 ft-lb, 1900 RPM, DC
Stem - 1-7/8" - 1/4P -1/2L
Design Differential Pressure - 1136 PSID

2-E51-F007, RCIC Inboard Steamline Isolation Valve

The original flex wedge gate valve for this MOV was changed to a double disk gate design prior to June 1990. The logic for this MOV is currently planned to be modified during the upcoming Fall 1991 refueling outage to bypass the close torque switch until the valve is approximately 96% closed. Additionally, the torque switch setting for this MOV is currently planned to be increased during the Fall 1991 refueling outage. The current configuration is given below.

Valve - 3", 900#, Anchor/Darling, Double Disk Gate
Actuator - SMB-00
Unit Ratio - 34.1:1
Motor - 5 ft-lb, 1700 RPM, AC
Stem - 3/4" - 1/4P - 1/4L
Design Differential Pressure - 1136 PSID

2-E51-F008, RCIC Outboard Steamline Isolation Valve

The original flex wedge gate valve for this MOV was changed to a double disk gate design prior to June 1990. The logic for this MOV is currently planned to be modified during the upcoming Fall 1991 refueling outage to bypass the close torque switch until the valve is approximately 96% closed. The current configuration is given below.

Valve - 3", 900#, Anchor/Darling, Double Disk Gate
Actuator - SMB-00
Unit Ratio - 38.6:1
Motor - 5 ft-lb, 1900 RPM, DC
Stem - 3/4" - 1/4P - 1/4L
Design Differential Pressure - 1136 PSID

2-G31-F001, RWCU Inlet Inboard Isolation Valve

The original flex wedge gate valve for this MOV was changed to a double disk gate design prior to June 1990. The logic for this MOV is currently planned to be modified during the upcoming Fall 1991 refueling outage to bypass the close torque switch until the valve is approximately 96% closed. The torque switch setting for this MOV is currently planned to be increased during the upcoming Fall 1991 refueling outage. The existing configuration is given below.

Valve - 6", 900#, Anchor/Darling, Double Disk Gate
Actuator - SMB-00
Unit Ratio - 72:1
Motor - 15 ft-lb, 1700 RPM, AC
Stem - 1-1/2" - 1/4P - 1/2L
Design Differential Pressure - 1150 PSID

2-G31-F004, RWCU Inlet Outboard Isolation Valve

The original flex wedge gate valve for this MOV was changed to a double disk gate design prior to June 1990. The logic for this MOV is currently planned to be modified during the upcoming Fall 1991 refueling outage to bypass the close torque switch until the valve is approximately 96% closed. The torque switch setting for this MOV is currently planned to be increased during the upcoming Fall 1991 refueling outage. The existing configuration is given below.

Valve - 6", 900#, Anchor/Darling, Double Disk Gate
Actuator - SMB-00
Unit Ratio - 77:1
Motor - 30 ft-lb, 1900 RPM, DC
Stem - 1-1/2" - 1/4P - 1/2L
Design Differential Pressure - 1150 PSID

QUESTION 2: Provide differential pressure and information necessary to confirm motor adequacy for each MOV with(in) the scope of Supplement 3.

RESPONSE: This information is provided for each valve in the response to Question 1 above.

QUESTION 3: Provide justification for exceeding the published ratings of the Limitorque SMB-00 actuator for the RWCU Unit 1 MOVs.

RESPONSE: Limitorque has indicated in the past that the published 14,000 lb thrust rating for SMB-00 actuators is a continuous rating, and is not meant to be considered as an absolute threshold for actuator acceptability. Since the current setting for the RWCU Unit 1 MOVs only exceeds the published continuous rating by 0.06%, CP&L considers the current setting for these MOVs to be acceptable. Limitorque was contacted regarding this setting, and has concurred with the above assessment. Considerable testing has been conducted within the industry and by Limitorque to extend the thrust ratings of SMB-00 actuators. Although the results of this testing have not yet been formally published, CP&L considers that this testing has demonstrated the higher ratings are justified.

QUESTION 4: Has the leakage rate with an MOV 96% closed been determined? Are the leakage limits of Appendix J and the ASME Code met with this percent MOV closure?

RESPONSE: As stated in our March 20, 1991 response to GL 89-10, Supplement 3, CP&L considers the MOVs in question to be capable of fully closing under design basis conditions. However, CP&L also considers that the design function of these MOVs will be accomplished if they achieve 96% closure during a High Energy Line Break (HELB) outside of primary containment.

The isolation valves in question have two independent safety functions: (1) to close after a LOCA to establish primary containment isolation, and (2) to close during a HELB to isolate flow into secondary containment.

Appendix J and ASME Section XI outline the valve leakage tests which are required to ensure acceptable valve leakage under LOCA conditions. During a LOCA, when primary containment is pressurized and a source term is present, these valves will not have to close against significant differential pressure or flow. Under LOCA conditions, the RWCU isolation valves will typically

close against zero flow and differential pressure, while the HPCI and RCIC isolation valves will close against normal flow and less than 150 psid. Since these differential pressures under LOCA conditions are significantly lower than design, the valves will fully close and containment isolation (Appendix J leakage) will be established.

During a HELB outside of containment, a source term is not created and primary containment is not pressurized. Therefore, it is not critical to establish containment isolation (Appendix J leakage) under these conditions. If the valves were to torque out at 96% closed, the valve port would be covered and flow would be isolated.

Field measurements of Brunswick double disk gate valves, which are within the scope of Supplement 3, indicate that the valve port is covered when these valves are approximately 90% closed. Due to the wide, flat seats and seat rings for these valves, good stellite to stellite seat contact will be achieved with the valve 96% closed.

Additionally, opening differential pressure testing of these valves at the manufacturer's facility and/or after installation revealed no significant leakage until the valve was approximately 10% open. Therefore, under HELB conditions, CP&L believes that the design function of these MOVs will be accomplished if 96% closure is achieved.

QUESTION 5: Provide justification for the "operability" of the current Unit 2 RCIC (F007) MOV.

RESPONSE: As stated in our March 20, 1991 response to Supplement 3, the torque switch for this MOV was set to deliver a stem thrust which is below the vendor's recommendation. This lower than desired setting occurred due to an error in Limitorque's Motor Actuator Characterizer (MAC) software for SMB-00 actuators. This error in the MAC software was discovered after the torque switch setting for this MOV had been established.

The manufacturer for this valve currently recommends the use of a conservative 0.3 valve factor in the design basis reviews to establish switch settings for their double disk gate valves. Due to the error in the MAC software, the torque switch for 2-E51-F007 was set below this vendor recommended value. However, information from the vendor in September 1990 indicates that their flow testing has shown an actual valve factor of less than 0.25 for their double disk gate valves. Since 2-E51-F007 is currently set to operate against loads which are higher than those associated with a 0.25 valve factor, CP&L considers this valve to be fully operable. As stated in our March 20, 1991 response to GL 89-10, Supplement 3 and the response to Question 1 above, CP&L plans to increase the torque switch setting for this MOV during the next refueling outage for Unit No. 2, currently scheduled for Fall 1991.

The above assessment was conducted using what CP&L believes to be the best information currently available for this valve. CP&L has reviewed NRC Information Notice (IN) No. 90-72, "Testing of Parallel Disc Gate Valves in Europe", and the ASME paper referenced therein for applicability to Brunswick double disk gate valves. CP&L finds it impractical to apply this information to the MOVs, because the IN and the ASME paper do not provide any information on the valve manufacturer or details of the internal configuration of the valve.

During CP&L review of the ASME paper referenced in IN 90-72, it was noted that the valve thrust equation used therein is different than the equation typically used by the industry. The thrust equation given in the ASME paper does not separate out the packing and stem rejection load terms. Therefore, the use of this equation would result in a higher valve factor than would be encountered using the standard industry equation. A valve factor which is calculated using the methodology suggested in the ASME paper cannot be used interchangeably with the valve factor used in the standard industry equation.

If the methodology suggested by the ASME paper is applied to 2-E51-F007, this MOV is capable of closing against the loads associated with a 0.47 valve factor. This is higher than the 0.40 valve factor which is given in IN 90-72 and the ASME paper as being required to close the valve. Therefore, the methodology and test data given in IN 90-72 and the ASME paper also suggests that 2-E51-F007 is fully capable of closing under design basis conditions at the current torque switch setting.

QUESTION 6: Provide details of the planned prototype parallel disk gate valve tests.

RESPONSE: This test program is being conducted by Anchor/Darling. During the development of this program, Anchor/Darling provided CP&L with the opportunity to review and comment on their test procedures and methodology. After reviewing the program with the technical staff of Anchor/Darling, CP&L has concluded that this prototype testing should provide data which demonstrates the performance characteristics of Brunswick double disk gate valves under design basis conditions. Since this is an Anchor/Darling sponsored test program, CP&L cannot disclose any details of this program unless authorized to do so by Anchor/Darling. CP&L suggests that the NRC contact the Anchor/Darling technical staff directly if further information is desired.

QUESTION 7: How have you addressed the rate of loading phenomenon in MOV sizing and torque switch settings?

RESPONSE: We do not specifically address the "rate of loading phenomenon" in our MOV torque switch setup methodology. It is not a factor that has been identified as being a quantified amount (or percentage). To date, there is no evidence that this phenomenon exists in all MOVs, and the specific effects appear to vary widely from one MOV configuration to another.

CP&L was queried about this subject during the recent GL 89-10 MOV program inspection for the H. B. Robinson plant. In response, CP&L stated that we will be observing the diagnostic results between the dynamic and static MOV testing, and if it becomes evident that our basic setup methodology can be improved by incorporating an additional factor based on reliable data, then the methodology will be revised.

CP&L is participating in EPRI's MOV Performance Prediction Program. Included in this program is a task to investigate the rate of loading issue. Should definitive results be produced from this effort, it is anticipated that CP&L would review EPRI's evaluation and incorporate the information into the MOV setup methodology as appropriate.

In addition, CP&L is monitoring reports from the industry on rate of loading in order to determine if there is a resolution to the issue that will provide a consistent methodology to account for the rate of loading. Since this issue is a generic industry issue and is potentially applicable to all MOVs, it does not apply only to the MOVs covered within the scope of GL 89-10, Supplement 3.

QUESTION 8: Provide explanation or justification as to why the Brunswick notification of a 10 CFR 21 reportable occurrence dated April 29, 1991 will not affect the Brunswick's December 17, 1990 response to Supplement 3 to GL 89-10.

RESPONSE: Our December 17, 1990 response to GL 89-10, Supplement 3 provided the required 30 day response to notify the NRC staff that we had completed the plant specific safety assessment for Brunswick Unit Nos. 1 and 2. CP&L believes that this question refers to CP&L's 120 day response which was provided on March 20, 1991 rather than the 30 day response, and responds accordingly.

The April 29, 1991 notification of a 10 CFR 21 reportable occurrence refers to the error CP&L identified in Limitorque's MAC software for SMB-00 actuators. This software error resulted in the MAC diagnostic equipment displaying SMB-00 actuator torque values which were significantly higher than the actual values. The magnitude of this error was quantified by a series of tests using CP&L's direct reading actuator torque stand.

The March 20, 1991 response to Supplement 3 included the effects of this MAC software error for those SMB-00 actuators which were tested using this equipment. The torque switch trip thrusts given in the response (and used for the capability reviews) reflect the corrected values for those MOVs affected. Therefore, the effects of this 10 CFR 21 reportable occurrence were fully considered in the March 20, 1991 response.