July 30, 1984

Docket Nos. 50-325/324

Mr. E. E. Utley
Executive Vice President
Carolina Power & Light Company
Post Office Box 1551
Raleigh, North Carolina 27062

Dear Mr. Utley:

SUBJECT: CONTAINMENT PRESSURE MONITOR, ITEM II.F.1.4
CONTAINMENT WATER LEVEL MONITOR, ITEM II.F.1.5
CONTAINMENT HYDROGEN MONITOR, ITEM II.F.1.6

Re: Brunswick Steam Electric Plant, Units 1 and 2

We have completed our review of the TMI Action items cited above. The submittals reviewed are those listed in the enclosed Safety Evaluation. We have concluded that you have met all the requirements of NUREG-0737, items II.F.1.4, II.F.1.5 and II.F.1.6 within the scope of Section 2 of the Safety Evaluation. We find that the design for these items is acceptable. Our Safety Evaluation is enclosed.

Sincerely,

Original signed by PAHermann for/

Domenic B. Vassallo, Chief
Operating Reactors Branch #2
Division of Licensing

Enclosure:
Safety Evaluation

cc w/enclosure:
See next page

DISTRIBUTION
Docket File
NRC PDR
Local PDR
ORB#2 Reading
DEisenhut
OELD
SNorris
MGrotenhuis
ELJordan
JNGrace
ACRS (10)
Gray File
PKapo
HNicolaras

DL:ORB#2	DL:ORB#2	DSI:CSB	DL:ORB#4	DL:ORB#2
SNorris:ajs	MGrotenhuis	PKapo	HNicolaras	DVassallo
07/24/84	07/ /84	07/ /84	07/ /84	07/30/84

per Houston memo dated 6/29/84

Mr. E. E. Utley
Carolina Power & Light Company
Brunswick Steam Electric Plant, Units 1 and 2

cc:

Richard E. Jones, Esquire
Carolina Power & Light Company
336 Fayetteville Street
Raleigh, North Carolina 27602

George F. Trowbridge, Esquire
Shaw, Pittman, Potts and Trowbridge
1800 M Street, N. W.
Washington, D. C. 20036

Mr. Charles R. Dietz
Plant Manager
Post Office Box 458
Southport, North Carolina 28461

Mr. Franky Thomas, Chairman
Board of Commissioners
Post Office Box 249
Bolivia, North Carolina 28422

Mrs. Chrys Baggett
State Clearinghouse
Budget and Management
116 West Jones Street
Raleigh, North Carolina 27603

U. S. Environmental Protection
Agency
Region IV Office
Regional Radiation Representative
345 Courtland Street, N. W.
Atlanta, Georgia 30308

Resident Inspector
U. S. Nuclear Regulatory Commission
Star Route 1
Post Office Box 208
Southport, North Carolina 28461

James P. O'Reilly
Regional Administrator
Region II Office
U. S. Nuclear Regulatory Commission
101 Marietta Street, Suite 3100
Atlanta, Georgia 30303

Dayne H. Brown, Chief
Radiation Protection Branch
Division of Facility Services
Department of Human Resources
Post Office Box 12200
Raleigh, North Carolina 27605

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

CAROLINA POWER & LIGHT COMPANY

BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2

DOCKET NOS. 50-325/324

RELATED TO TMI ACTION ITEMS (NUREG-0737)

II.F.1.4 CONTAINMENT PRESSURE MONITOR

II.F.1.5 CONTAINMENT WATER LEVEL MONITOR

II.F.1.6 CONTAINMENT HYDROGEN MONITOR

TABLE OF CONTENTS

1.0 BACKGROUND

By our letter of September 5, 1980 (Reference 1) to: (1) licensees of operating plants; (2) applicants for operating licenses; and (3) holders of construction permits; we issued a summary listing of all the approved TMI Action Plan Requirements. In November of 1980 we issued NUREG-0737, Clarification of TMI Action Plan Requirements (Reference 2), which specifies TMI Action Plan Items approved by the Commission for implementation. This Safety Evaluation (SE) addresses three of the TMI Action Plan Items, II.F.1.4,5,6.

2.0 SCOPE OF REVIEW

This SE addresses all the requirements of II.F.1.4,5,6 except the following:

(1) ENVIRONMENTAL QUALIFICATION OF EQUIPMENT

The scope of our review includes all the NUREG-0737 requirements except for the criteria requiring that the equipment be environmentally qualified (Appendix B of NUREG-0737 and Regulatory Guide 1.89). This issue will be reviewed separately under the scope of the Commission's environmental qualification program. In NUREG-0737, for each item the requirements are partly expressed in a list of clarifications. For each of items II.F.1.4,5,6, clarification (1) is a statement of the environmental qualification requirement. In this SE, Sections 3.2, 4.2 and 5.2 are verbatim copies of the clarifications in NUREG-0737, except that clarification (1) from NUREG-0737 has been omitted.

(2) IMPLEMENTATION SCHEDULE

The implementation schedule is being addressed by Confirmatory Orders, and is not included as part of this SE.

3.0 II.F.1.4: CONTAINMENT PRESSURE MONITOR SYSTEM (CPMS)

3.1 NUREG-0737 CPMS POSITION

A continuous indication of containment pressure shall be provided in the control room of each operating reactor. Measurement and indication capability shall include three times the design pressure of the containment for concrete, four times the design pressure for steel, and -5 psig for all containments.

3.2 NUREG-0737 CPMS CLARIFICATION

(1) Omitted as explained in Section 2.0.

(2) Measurement and indication capability shall extend to 5 psia (-10 psig) for subatmospheric containments.

(3) Two or more instruments may be used to meet the range requirements. However, instruments that need to be switched from one scale to another scale to meet the range requirements are not acceptable.

(4) Continuous display and recording of the containment pressure over the specified range in the control room is required.

(5) The accuracy and response time specifications of the pressure monitor shall be provided and justified to be adequate for their intended function.

3.3 SCOPE OF CPMS EVALUATION

The licensee has described his design for the CPMS in references from 3 on. Our review of the licensee's submittals consists of the following: (1) checking for deviations from our requirements which are stated in Sections 3.1 and 3.2 above, (2) reviewing the adequacy of the accuracy specifications of the CPMS, and (3) reviewing the adequacy of the response time specifications of the CPMS. The figures quoted herein for accuracy are three standard deviations, which represents a 99.7% confidence level. All accuracy figures are quoted as a percentage of full scale. The figures quoted for response time are the 100% response values. For linear transfer functions we are using the convention that the time for 100% response is four time constants.

3.4 LICENSEE COMPLIANCE WITH NUREG-0737 CPMS REQUIREMENTS

After reviewing Brunswick's submittals, we find that the CPMS design meets all the requirements of Sections 3.1 and 3.2 above.

3.5 EVALUATION OF CPMS ACCURACY AND TIME RESPONSE

One CPMS channel has its readout on a recorder-indicator and the other channel has its readout on an indicator only. Both readouts are in the control room. The system ranges, accuracies and response times of the CPMS channels are listed in Table 1. These values, which are consistent with the present state of the art, will provide information over the intended range of the CPMS that is sufficiently accurate and useful to allow the plant operator to adequately assess pressure conditions within containment.

TABLE 1

RANGE, ACCURACY AND RESPONSE TIME OF CPMS CHANNELS

Transmitter Temperature (degf)	70	210	135
Recorder-Indicator Loop System Accuracy (%)	1.2	2.4	1.5
Indicator Loop System Accuracy (%)	2.7	3.4	2.9
CPMS Range (psig)			-5 to +245
Recorder-Indicator Loop System Response Time (sec)			1.0
Indicator Loop System Response Time (sec)			3.3

The ambient temperature at the pressure transmitters is 70 degf. In its studies Brunswick has found that immediately after the onset of a LOCA or HELB the temperature will spike to 210 degf, remain there about 17 minutes, and then decrease to a stable temperature of 135 degf in the next 125 minutes.

4.0 II.F.1.5: CONTAINMENT WATER LEVEL MONITOR SYSTEM (CWLMS)

4.1 NUREG-0737 CWLMS POSITION

A continuous indication of containment water level shall be provided in the control room for all plants. A narrow-range instrument shall be provided for PWRs and cover the range from the bottom to the top of the containment sump. A wide-range instrument shall also be provided for PWRs and shall cover the range from the bottom of the containment to the elevation equivalent to 800,000 gallon capacity. For BWRs, a wide-range instrument shall be provided and cover the range from the bottom to five feet above the normal water level of the suppression pool.

4.2 NUREG-0737 CWLHS CLARIFICATION

(1) Omitted as explained in Section 2.0.

(2) The measurement capability of 600,000 gallons is based on recent plant designs. For older plants with smaller water capacities, licensees may propose deviations from this requirement based on the available water supply capability at their plant.

(3) Narrow-range water level monitors are required for all sizes of sumps inside the containment.

(4) For BWR pressure-suppression containments, the Emergency Core Cooling System (ECCS) suction line inlets may be used as a starting reference point for the wide-range water level monitors, instead of the bottom of the suppression pool.

(5) The accuracy requirements of the water level monitors shall be provided and justified to be adequate for their intended function.

4.3 SCOPE OF CWLHS EVALUATION

The licensee has described his design for the CWLHS in references from 3 on. Our review of the licensee's submittals consists of the following: (1) checking for deviations from our requirements which are stated in Sections 4.1 and 4.2 above, and (2) reviewing the adequacy of the accuracy specifications for the CWLHS. The figures quoted herein for accuracy are three standard deviations, which represents a 99.7% confidence level. All accuracy figures are expressed as a percentage of full scale.

4.4 LICENSEE COMPLIANCE WITH NUREG-0737 CWLHS REQUIREMENTS

After reviewing Brunswick's submittals, we find that the CWLHS design meets all the requirements of Sections 4.1 and 4.2 above.

4.5 EVALUATION OF CWLHS ACCURACY

Brunswick has installed CWLHSs in the torus only, which fulfills the requirements of Sections 4.1 and 4.2 above. The water level sensors are 16 feet long and extend from just below the bottom of the RHR suction lines to 6'7" above the normal torus water level. One CWLHS channel has its readout on a recorder-indicator and the other channel has its readout on an indicator only. Both readouts are in the control room. The accuracies of the CWLHS channels are given in Table 2. These values, which are consistent with the present state of the art, will provide information over the intended range of the CWLHS that is sufficiently accurate and useful to allow the plant operator to adequately assess water level conditions.

TABLE 2

SYSTEM ACCURACY OF CWLMS LOOPS

Transmitter Temperature (degf)	70	295	135
Recorder-Indicator Loop System Accuracy (%)	2.7	8.2	7.2
Indicator Loop System Accuracy (%)	1.2	7.8	6.8

The ambient temperature of the water level transmitter is 70 degf. In its studies Brunswick has found that after the onset of a LOCA or HELB the temperature will spike to 295 degf, remain there about 70 seconds and then decrease to a stable temperature of 135 degf in the next 275 hours.

5.0 II.F.1.5: CONTAINMENT HYDROGEN MONITOR SYSTEM (CHMS)

5.1 NUREG-0737 CHMS POSITION

A continuous indication of hydrogen concentration in the containment atmosphere shall be provided in the control room. Measurement capability shall be provided over the range of 0% to 10% hydrogen concentration under both positive and negative ambient pressures.

5.2 NUREG-0737 CHMS CLARIFICATION

(1) Omitted as explained in Section 2.0.

(2) The continuous indication of hydrogen concentration is not required during normal operation. If an indication is not available at all times, continuous indication and recording shall be functioning within 30 minutes of the initiation of safety injection.

(3) The accuracy and placement of the hydrogen monitors shall be provided and justified to be adequate for their intended function.

5.3 SCOPE OF CHMS EVALUATION

The licensee has described his design for the CHMS in references from 3 on. Our review of the licensee's submittals consists of the following: (1) checking for deviations from our requirements which are stated in Sections 5.1 and 5.2 above, (2) reviewing the adequacy of the accuracy specifications for the CHMS, and (3) reviewing the adequacy of the hydrogen sample port placement for the CHMS. The figures quoted herein for accuracy are three standard deviations, which represents a 99.7% confidence level. All accuracy figures are expressed as a percentage of full scale.

5.4 LICENSEE COMPLIANCE WITH NUREG-0737 CHMS REQUIREMENTS

After reviewing Brunswick's submittals, we find that the CHMS design meets all the requirements of Sections 5.1 and 5.2 above.

Brunswick has installed identical redundant pairs of hydrogen and oxygen monitors with a hydrogen range of 30% and an oxygen range of 25%. The readout for each hydrogen/oxygen monitor is a Speedomax Multipoint Indicating Recorder located in the control room. Rather than continuous lines, the Speedomax plots distinguishable points for the hydrogen and oxygen readings, and at any time the indicating arrow is positioned at the point being plotted. Thus the indicating arrow oscillates back and forth between the hydrogen reading and the oxygen reading. This indicating system should not cause the control room operator any confusion after he has worked with it a short time.

Brunswick has developed a procedure for correcting for the effect of water vapor in their gas measurements, so that water vapor in containment will contribute, at most, a very small error in the gas measurements.

5.5 EVALUATION OF CHMS ACCURACY AND SAMPLE PORT PLACEMENT

Each of the two instrument systems is connected to four different sample points from the primary containment (General Electric, Mark I). The sample sources are: (1) suppression pool atmosphere, (2) lower drywell, (3) mid drywell, (4) drywell head. Normal sample lineup is for one system to draw from the suppression pool atmosphere and the other from a drywell source.

The accuracy of the CHMS immediately after calibration is 2.8%. This value, which is consistent with the present state of the art, will provide information over the intended range of the CHMS that is suifficiently accurate and useful to allow the plant operator to adequately asses tha hydrogen concentration within the torus and drywell.

Any hydrogen gas that escapes the core and is released from the primary coolant system boundary (either via steam relief valves or coolant system rupture) will become mixed in either the suppression pool or drywell general air space. There are no compartments or barriers in Brunswick's containment that would pronibit or delay such mixing from taking place. This arrangement provides rapid and accurate detection of hydrogen escaping from the reactor system.

5.6 EVALUATION OF CHMS LONG TERM DRIFT

Immediately after calibration, both the hydrogen and oxygen monitors have a system accuracy of 2.8% of full scale. However, the vendor states that the sensors may suffer a drift as large as about 2% per month. The current Technical Specifications require that the monitors be recalibrated about once per six months. Assuming the drift is linear in time would lead us to conclude that near the end of a calibration cycle the accuracy of the hydrogen and oxygen monitors may be on the order of 12%, which we find unacceptable.

In order to demonstrate that the as-built CHMS channels suffer an acceptable amount of drift, CP&L has submitted Reference 6 which lists the actual observed drifts for the Brunswick 1 & 2 CHMS channels. While little data have been collected to date, the trend indicates that one of the four CHMS channels observed will drift a little more than 4% in six months, and the other three channels will drift significantly less. The channel suffering the worst drift would have an overall accuracy figure of about 5% at the end of a calibration cycle; we find this, the largest observed overall accuracy figure, to be within acceptable bounds. From these data we conclude that long term drift of the CHMS channels is not a pressing problem at Brunswick 1 or Brunswick 2; we conclude that CP&L has the potential problem sufficiently in hand that we need give it no further attention.

In order to approach this problem cautiously, CP&L has adopted a scheduled recalibration for each CHMS channel once per three months, rather than once per six months, as is required by the Technical Specifications. While they are free to fall back to the Technical Specification recalibration schedule at any time, CP&L should be commended for taking the initiative of starting with a more prudent recalibration schedule for the CHMS channels than is required of them.

6.0 CONCLUSION

Based on the above evaluations, the licensee has met all the requirements of NUREG-0737 for items II.F.1.4,5,6 within the scope of the review of this SE as described in Section 2.0. We, therefore, find the design for these three items acceptable.

7.0 REFERENCES

(1) Letter from D. G. Eisenhut (NRC) to All Licensees of Operating Plants and Applicants for Operating Licenses and Holders of Construction Permits, 5 Sep 80. Subject: Preliminary Clarification of TMI Action Plan Requirements.

(2) NUREG-0737, "Clarification of TMI Action Plan Requirements," U. S. Nuclear Regulatory Commission, Nov 1980.

(3) Letter from Domenic B. Vassallo (NRC) to S. R. Zimmerman (CP&L) dated 2 Feb 84. Subject: NRC Request for Additional Information (RAI) on the CPMS, CWLMS, and CHMS.

(4) Letter from S. R. Zimmerman (CP&L) to Domenic B. Vassallo (NRC) dated 9 Mar 84. Subject: Response to the RAI of Reference 3.

(5) Letter from S. R. Zimmerman (CP&L) to Domenic B. Vassallo (NRC) dated 6 Apr 84. Subject: Document phone calls made to clarify some points in Reference 4.

(6) Letter from S. R. Zimmerman (CP&L) to Domenic B. Vassallo (NRC) dated July 10, 1984. Subject: Long term drift data for hydrogen monitors collected to date at the Brunswick Plants.