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

AUG 25 1992

SERIAL: NLS-92-233
10 CFR 50.90
TSC 91TSB16

R. B. STARKEY, JR.
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
REQUEST FOR LICENSE AMENDMENT
CONTROL ROD SCRAM TIME TESTING

Gentlemen:

In accordance with the Code of Federal Regulations, Title 10, Parts 50.90 and 2.101, Carolina Power & Light Company (CP&L) hereby requests a revision to the Technical Specifications for the Brunswick Steam Electric Plant (BSEP), Units 1 and 2.

The proposed change increases the acceptable limits for control rod average scram insertion times from 0.040 to 0.049 seconds for each of the rod positions listed in Technical Specifications 3.1.3.3 and 3.1.3.4. In addition, the proposed change revises the values of mu, sigma, and τ_A specified in Technical Specification 3.2.2.2 that are used to determine the cycle average 20 percent scram time (τ_{ave}).

Enclosure 1 provides a detailed description of the proposed changes and the basis for the changes.

Enclosure 2 details, in accordance with 10 CFR 50.91(a), the basis for the Company's determination that the proposed changes do not involve a significant hazards consideration.

Enclosure 3 provides an environmental evaluation which demonstrates that the proposed amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental assessment needs to be prepared in connection with issuance of the amendment.

Enclosure 4 provides the marked-up Technical Specification pages for Unit 1.

Enclosure 5 provides the marked-up Technical Specification pages for Unit 2.

CP&L is providing, in accordance with 10 CFR 50.91(b), the State of North Carolina with a copy of the proposed license amendment.

In order to allow time for procedure revision and orderly incorporation into copies of the Technical Specifications, CP&L requests that the proposed

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amendments, once approved by the NRC, be issued with an effective date to be no later than 60 days from the issuance of the amendment.

Please refer any questions regarding this submittal to Mr. K. A. Harris at (919) 546-3077.

Yours very truly,

R. B. Starkey, Jr.

KAH/kah (scramtsc.th)

Enclosures:
1. Basis for Change Request
2. 10 CFR 50.92 Evaluation
3. Environmental Considerations
4. Marked-up Technical Specification Pages - Unit 1
5. Marked-up Technical Specification Pages - Unit 2

R. B. Starkey, Jr., 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.

cc: Mr. Dayne H. Brown
Mr. S. D. Ebneter
Mr. R. H. Lo
Mr. R. L. Prevatte

ENCLOSURE 1

BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2
NRC DOCKET NOS. 50-325 & 50-324
OPERATING LICENSE NOS. DPR-71 & DPR-62
REQUEST FOR LICENSE AMENDMENT
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BASIS FOR CHANGE REQUEST

Background:

The Rod Worth Minimizer (RWM) hardware was upgraded to a NUMAC-based system in 1989 for Unit 1 and in 1988 for Unit 2. The capabilities of the upgraded RWM system allow more detailed and complete insertion times to be recorded, including the timing of both the pickup and the dropout of individual reed switches during each automatic scram and during individual control rod scram time testing required by Technical Specification 4.1.3.2.

The current values of the scram insertion times of Technical Specification 3.1.3.3 are based on the 67B scram insertion time curve. The capability to directly measure the dropout times for each individual reed switch makes it unnecessary to interpret the 67B scram insertion time curve to obtain scram insertion times. The proposed values for Technical Specification 3.1.3.3 are the 67B scram curve percent insertion values adjusted to a nearby notch position and the middle of the reed switch. These notch position insertion times are reported to the nearest millisecond, consistent with the edit of the RWM-NUMAC System.

To avoid possible confusion and to maintain consistency between the different Technical Specifications addressing scram insertion times, the proposed change revises the values of mu, sigma, and r_A in Specification 3.2.2.2 to values appropriate for dropout of the reed switch and the proposed Technical Specification 3.1.3.3 notch 36 scram insertion time.

Proposed Change:

The proposed change increases the acceptable limits for control rod average scram insertion times from 0.040 to 0.049 seconds for each of the rod positions listed in Technical Specifications 3.1.3.3 and 3.1.3.4. In addition, the proposed change revises the values of mu, sigma, and r_A specified in Technical Specification 3.2.2.2 that are used to determine the cycle average 20% scram time (r_{ave}).

Basis:

Technical Specifications 3.1.3.3 and 3.1.3.4 ensure that control rod insertion times are consistent with those used in the accident analysis. Specifically, control rod scram insertion times are listed in the Technical Specifications

to ensure that actual control rod drive performance during a plant transient is bounded by the reactivity assumed in the safety analysis to be inserted by a reactor scram. The control rod system is analyzed to bring the reactor subcritical at a rate fast enough to prevent the Minimum Critical Power Ratio (MCPR) from becoming less than the Safety Limit MCPR of Technical Specification 2.1.2 during the limiting power transient analyzed in Section 14.3 of the Final Safety Analysis Report (Section 15.2 of the Updated Final Safety Analysis Report). This analysis shows that the negative reactivity rates resulting from the scram with the average response of all drives, as stated in Technical Specifications 3.1.3.3 and 3.1.3.4, provide the required protection and that MCPR remains greater than the Safety Limit MCPR of Technical Specification 2.1.2.

Technical Specification 3.1.3.3 provides requirements for the average scram insertion time of all OPERABLE control rods. The Technical Specification 3.1.3.3 insertion times are stipulated for four insertion positions. Technical Specification 3.1.3.4 provides requirements for the average scram insertion time of each group of four control rods (arranged in a two-by-two array). The Technical Specification 3.1.3.4 insertion times are also stipulated for four insertion positions.

In the recent and current safety analyses performed each cycle, the scram reactivity function assumed is the 67B scram insertion time curve. The 67B scram insertion time curve specifies the amount of scram reactivity in terms of percent insertion as a function of time. Control rod scram insertion times can be measured from the de-energization of the scram solenoid to either the pickup or dropout of the control rod notch position reed switch. For simplicity in demonstrating compliance to the 67B scram curve, the 67B curve information is converted from percent insertion versus time to notch position versus time.

The 67B scram curve times represent the time at which the control rod reaches the indicated percent insertion. When a control rod scrams from the fully withdrawn position, the "full out" and notch 48 reed switches first drop out as the control rod starts its insertion motion. When the initial reed switch dropout occurs, the control rod has already inserted a distance that is on the order of the length of the reed switch (approximately one inch). For purposes of adjusting the 67B scram curve times from percent insertion to notch position dropout, the control rod is taken to be inserted approximately one-half this distance (i.e., approximately 1/2 inch).

To convert from percent insertion versus time to notch position dropout versus time, a notch position near the specific 67B percent inserted value is selected. The percent insertion of this notch position is determined by linear interpolation and increased by the insertion needed to achieve dropout of the reed switch (approximately half the length of the reed switch). The time required for the equivalent notch position dropout insertion percentage is then calculated by linear interpolation between adjacent 67B curve percent scram insertion times.

The scram insertion times as a function of notch position from the de-energization of the scram solenoid to dropout of the control rod position reed

switch for the three fastest control rods in each group of four control rods and for the average of all control rods are documented in Reference 1. These values are presented in Table 1 below. Both two and three significant figures after the decimal point are provided. Truncation of the third digit to the right of the decimal point is conservative when reporting only two significant figures after the decimal point since this requires the control rods be inserted faster.

Table 1: Scram Insertion Times
from Reference 1 (Attachment 1)

Notch Position	3 of 4 time (sec)	3 of 4 time (sec)	Average time (sec)	Average time (sec)
46	0.37	0.379	0.35	0.358
36	1.16	1.162	1.09	1.096
26	1.97	1.971	1.86	1.860
06	3.62	3.624	3.41	3.419

The RWM hardware was upgraded to a NUMAC-based system in 1989 for Unit 1 and in 1988 for Unit 2. The capabilities of the upgraded RWM system allow more detailed and complete insertion times to be recorded, including the timing of both the pickup and the dropout of individual reed switches during each automatic scram and during individual control rod scram time testing required by Technical Specification 4.1.3.2.

The existing requirements of Technical Specifications 3.1.3.3 and 3.1.3.4 are the values of Table 1 above, reported to two significant figures after the decimal point reduced by 0.04 seconds to conservatively bound the delay between pickup and dropout. Actual recorded data from the upgraded RWM system indicate that the average delay between reed switch pickup and dropout is approximately 0.02 seconds. These measurements confirm the conservatism of the 0.04 second value that was previously assumed in adjusting the 67B scram curve from reed switch dropout times to reed switch pickup times.

Since there now exists the capability to directly measure the dropout times for each individual reed switch using the NUMAC-based RWM system, it is no longer necessary to interpret the 67B scram curve for pickup times. Based on the direct measurement capability, the proposed values for Technical Specifications 3.1.3.3 and 3.1.3.4 are the 67B scram curve percent insertion values adjusted to a nearby notch position and for the physical dimensions of the reed switch. The notch position insertion times currently cited in Technical Specifications 3.1.3.3 and 3.1.3.4 are reported to the nearest hundredths of a second. The proposed notch position insertion times are

reported to the nearest millisecond, consistent with the output format of the RWM system.

The values of mu and sigma referenced in Technical Specification 3.2.2.2 are used to determine the scram time requirement (τ_B) for use of reduced thermal limits provided by the ODYN Option B methodology. When the cycle average insertion time (τ_{ave}) is less than τ_B, the ODYN Option B thermal limits are applicable. When the value of τ_{ave} is greater than the value of τ for ODYN Option B (τ_B) but less than the value of τ for ODYN Option A (tau_A), the thermal limits are determined by linear interpolation between the ODYN Option A and B thermal limits. This process is described in Technical Specification 3.2.2.2.

The current values of mu, sigma, and τ_A in Technical Specification 3.2.2.2 are appropriate when the cycle average insertion time (τ_{ave}) is measured from de-energization of the scram pilot valve solenoid to reed switch pickup at the notch 36 position. The proposed values of mu (0.830) and sigma (0.019) are appropriate when the insertion time is measured from de-energization of the scram pilot valve solenoid to dropout of the notch 36 position reed switch notch (see Table 3, Reference 1).

REFERENCES:

1. Letter, L. M. Quintana to B. A. Morgen, "Dropout Basis Scram Insertion Times Requirements," December 9, 1991, LMQ:91-341, File NF 402.1004.

ATTACHMENT 1 TO ENCLOSURE 1

BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2
NRC DOCKET NOS. 50-325 & 50-324
OPERATING LICENSE NOS. DPR-71 & DPR-62
REQUEST FOR LICENSE AMENDMENT
CONTROL ROD SCRAM TIME TESTING

REFERENCE 1

→ File

GE Nuclear Energy

General Electric Company
175 Curtner Avenue, San Jose, CA 95125

Mail Code 174

NF- 402.1004

December 9, 1991
LMQ:91-341

cc: S. J. Ganthner
R. G. Matthews
K. A. Scott

Mr. B. A. Morgen
Project Engineer - Fuel Projects
Carolina Power & Light Company
P. O. Box 1551
Raleigh, NC 27602

Subject: Dropout Basis Scram Insertion Times Requirements

Reference:

1) Letter, G. R. Hull to J. D. Martin, "Brunswick 1/2 Scram Insertion Times," December 14, 1982.

2) Letter, L. M. Quintana to J. D. Martin, "Control Rod Scram Insertion Times - 67B Curve," October 31, 1983.

3) Letter, L. M. Quintana to B. A. Morgen, "Additional Information for Application of GEMINI Methods," April 14, 1987.

4) Letter, L. M. Quintana to B. A. Morgen, "Technical Specifications for Three of Four Control Blades," October 9, 1991.

Dear Bruce:

Per CP&L's request, this letter provides documentation supporting a proposed technical specifications (T/S) change to the control blade scram insertion times required for (1) the average of all operable control blades, (2) the average of the three fastest in every two-by-two group of blades, and (3) the GEMINI methods ODYN Option B mean (μ), standard deviation (σ), and 20% insertion average time (τ_A) values from a pickup of the reed switch basis to a dropout of the reed switch basis.

Background

Reference 1 documented the 67B curve scram time requirements on a T/S format, i.e., based on certain notch positions and measurable occurrences (pickup of reed switch). Reference 2 provided background for the 67B curve and indicated that the notch position versus time T/S values could be obtained by linear interpolation of the 67B curve inputs. This is a conservative, simplified approach which does not take credit for the physical characteristics of the reed switches. A more detailed approach to calculate the dropout T/S values is discussed later. Reference 2 also

documented the conservative application of a 0.040 second difference between pickup and dropout of the reed switch which was used to support the currently existing Brunswick 1 and 2 T/S requirements.

Reference 3 provided an update to the μ and σ T/S values to support the change from the earlier GENESIS methodology to the current GEMINI methods. Table 1 of Attachment 2 to this letter provided the current pickup basis Brunswick 1 and 2 T/S values for μ and σ. The Brunswick 1 and 2 T/S value for τ_A is correctly based on the corresponding Brunswick core average scram time for notch 36, 1.05 seconds for pickup of the reed switch. (The values for τ_A in Reference 3, while conservative, should not be used in favor of the core average scram times described herein.)

CP&L recently requested the dropout basis best three out of four scram time requirements. These were provided via Reference 4 and are provided again herein.

Recommended Dropout Basis Scram Times and Option B Values

The attached tables contain the 67B scram time requirements as a function of both insertion fraction and dropout basis notch position. The values for notch positions are consistent with the design specifications for the control rod drive system and have been provided to three decimal places for your information. If two decimal place values are desired, the last digit should be conservatively dropped. The notch position times are based on detection of the dropout of the applicable reed switch (switch opening). The dropout insertion fractions are assumed to be 0.34% beyond the nominal notch position to account for the physical characteristics of the reed switches. The GEMINI methods ODYN Option B μ and σ for dropout are shown and are the same as those provided in Reference 3. The τ_A value shown in the attached table should be used in lieu of the value in Reference 3.

If there are any further questions, please do not hesitate to call us.

Very truly yours,

Louis M. Quintana

Louis M. Quintana
Fuel Project Manager
Brunswick 1&2
(408) 525-2026

lmq

Attachment

ATTACHMENT TO LMQ:91-[illegible]

Table 1
67B Scram Time Requirements

% Insertion	Average Scram Insertion Time (seconds)	Average of the Fastest 3 of Each 2x2 Array (seconds)
0.00	0.200	0.200
5.00	0.375	0.398
20.00	0.900	0.954
50.00	2.000	2.[illegible]
90.00	3.500	3.[illegible]

Table 2
Technical Specification Requirements

Dropout of Reed Switch	Average Scram Insertion Time (seconds)	Average of the Fastest 3 of Each 2x2 Array (seconds)
46	0.350	0.379
36	1.096	1.162
26	1.860	1.971
06	3.419	3.624

Table 3
GEMINI ODYN Option B Requirements

Dropout of Reed Switch	τ_A (seconds)*	μ (seconds)*	σ (seconds)
36	1.096**	0.830	0.019

*Times based on deenergization of the scram pilot valve solenoids as time zero.

**From Table 2.

ENCLOSURE 2

BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2
NRC DOCKET NOS. 50-325 & 50-324
OPERATING LICENSE NOS. DPR-71 & DPR-62
REQUEST FOR LICENSE AMENDMENT
CONTROL ROD SCRAM TIME TESTING

10 CFR 50.92 EVALUATION

The Commission has provided standards in 10 CFR 50.92(c) for determining whether a significant hazards consideration exists. A proposed amendment to an operating license for a facility involves no significant hazards consideration if operation of the facility in accordance with the proposed amendment would not: (1) involve a significant increase in the probability or consequences of an accident previously evaluated, (2) create the possibility of a new or different kind of accident from any accident previously evaluated, or (3) involve a significant reduction in a margin of safety. Pursuant to 10 CFR 50.91(a)(1), Carolina Power & Light Company has reviewed this proposed license amendment request and determined that its adoption would not involve a significant hazards consideration. The bases for this determination are as follows:

Proposed Change:

The proposed change increases the acceptable limits for control rod average scram insertion times from 0.040 to 0.049 seconds for each of the rod positions listed in Technical Specifications 3.1.3.3 and 3.1.3.4. In addition, the proposed change revises the values of mu, sigma, and τ_A specified in Technical Specification 3.2.2.2 that are used to determine the cycle average 20 percent scram time (τ_{ave}).

Basis:

The change does not involve a significant hazards consideration for the following reasons:

1. The proposed change does not involve a significant increase in the probability of an accident previously evaluated. The values of mu, sigma, and τ_A in Technical Specification 3.2.2.2 do not affect any physical system or equipment which would change the probability of an accident. The proposed change to Technical Specifications 3.1.3.3 and 3.1.3.4 to increase the control rod average insertion times will not cause unplanned initiation of the control rod system, will not impede the initiation of the control rod system, and will not affect the probability of a control rod drop accident. Therefore, the proposed change does not result in a significant increase in the probability of an accident previously evaluated.

The proposed change does not involve a significant increase in the consequences of an accident previously evaluated. Technical Specifications 3.1.3.3 and 3.1.3.4 ensure that control rod insertion times are consistent with those used in the accident analysis. Specifically, control rod scram insertion times are listed in the Technical Specifications to ensure that actual control rod drive performance during a plant transient is bounded by the reactivity assumed in the safety analysis to be inserted by a reactor scram. The control rod system is analyzed to bring the reactor subcritical at a rate fast enough to prevent the Minimum Critical Power Ratio (MCPR) from becoming less than the Safety Limit MCPR of Technical Specification 2.1.2 during the limiting power transient analyzed in Section 15.2 of the Updated Final Safety Analysis Report. The proposed change will define the scram insertion time from de-energization of the scram solenoid to dropout of the control rod position reed switch instead of from de-energization of the scram solenoid to pickup of the control rod position reed switch. The proposed values of mu, sigma, and τ_A will maintain fuel thermal limits equivalent to the existing fuel thermal limits and ensure that the Safety Limit MCPR stated in Technical Specification 2.1.2 is not exceeded. Consequently, fuel failure assumptions previously used in analyses will not be exceeded, thereby ensuring the consequences of previously evaluated accidents and operational transients will not be significantly increased.

2. The proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated. The proposed changes to Technical Specifications 3.1.3.3 and 3.1.3.4 to increase the control rod average insertion times and the proposed changes to the values of mu, sigma, and τ_A in Technical Specification 3.2.2.2 do not alter or change the manner in which the control rod system performs its safety function. Also, the proposed changes will not cause unplanned initiation of the control rod system nor will the proposed changes impede the initiation of the control rod system. No new or different mode of plant operation will be created as a result of the proposed changes; therefore, no new or different kinds of accident than that previously evaluated will be created.

3. The proposed change does not involve a significant reduction in the margin of safety. As discussed in Item 1 above, Technical Specifications 3.1.3.3 and 3.1.3.4 ensure that control rod insertion times are consistent with those used in the accident analysis. Specifically, control rod scram insertion times are listed in the Technical Specifications to ensure that actual control rod drive performance during a plant transient is bounded by the reactivity assumed in the safety analysis to be inserted by a reactor scram. The control rod system is analyzed to bring the reactor subcritical at a rate fast enough to prevent the MCPR from becoming less than the Safety Limit MCPR of Technical Specification 2.1.2 during the limiting power transient analyzed in Section 15.2 of the Updated Final Safety Analysis Report. The proposed change will define the scram insertion time from de-energization of the scram solenoid to dropout of the control rod position reed switch instead of from de-energization of the scram

solenoid to pickup of the control rod position reed switch. The proposed values of mu, sigma, and r_A will maintain fuel thermal limits equivalent to the existing fuel thermal limits and ensure that the Safety Limit MCPR stated in Technical Specification 2.1.2 is not exceeded. By ensuring that the Safety Limit MCPR is not exceeded, fuel failure assumptions previously used in the safety analysis will not be exceeded; therefore, the margin of safety will not be significantly reduced.

ENCLOSURE 3

BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2
NRC DOCKET NOS. 50-325 & 50-324
OPERATING LICENSE NOS. DPR-71 & DPR-62
REQUEST FOR LICENSE AMENDMENT
CONTROL ROD SCRAM TIME TESTING

ENVIRONMENTAL CONSIDERATIONS

10 CFR 51.22(c)(9) provides criterion for and identification of licensing and regulatory actions eligible for categorical exclusion from performing an environmental assessment. A proposed amendment to an operating license for a facility requires no environmental assessment if operation of the facility in accordance with the proposed amendment would not: (1) involve a significant hazards consideration; (2) result in a significant change in the types or significant increase in the amounts of any effluents that may be released offsite; (3) result in an increase in individual or cumulative occupational radiation exposure. Carolina Power & Light Company has reviewed this request and determined that the proposed amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment needs to be prepared in connection with the issuance of the amendment. The basis for this determination follows.

Proposed Change:

The proposed change increases the acceptable limit for control rod average scram insertion times from 0.040 to 0.049 seconds for each of the rod positions listed in Technical Specifications 3.1.3.3 and 3.1.3.4. In addition, the proposed change revises the values of mu, sigma, and τ_A specified in Technical Specification 3.2.3.2 that are used to determine the cycle average 20 percent scram time (τ_{ave}).

Basis:

The change meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9) for the following reasons:

1. As demonstrated in Enclosure 2, the proposed amendment does not involve a significant hazards consideration.

2. The proposed amendment does not result in a significant change in the types or significant increase in the amounts of any effluents that may be released offsite. Technical Specifications 3.1.3.3 and 3.1.3.4 ensure that control rod insertion times are consistent with those used in the accident analysis. Specifically, control rod scram insertion times are listed in the Technical Specifications to ensure that actual control rod drive performance during a plant transient is bounded by the

reactivity assumed in the safety analysis to be inserted by a reactor scram. The control rod system is analyzed to bring the reactor subcritical at a rate fast enough to prevent the MCPR from becoming less than the Safety Limit MCPR of Technical Specification 2.1.2. The proposed values of mu, sigma, and τ_A will maintain fuel thermal limits equivalent to the existing fuel thermal limits and ensure that the Safety Limit MCPR is not exceeded. By ensuring that the Safety Limit MCPR is not exceeded, fuel failure assumptions previously used in the safety analysis will not be exceeded. This will ensure the radiological source term used in the accident analysis remains bounded by that previously evaluated. As such, the proposed change cannot affect the types or amounts of any effluents that may be released offsite.

3. The proposed amendment does not result in an increase in individual or cumulative occupational radiation exposure. The proposed change will not alter the normal background radiation levels within the plant work areas. Therefore, the amendment has no affect on either individual or cumulative occupational radiation exposure.