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SUBJECT: Application for amend to License NPF-63, revising Tech Specs re implemention of variable shutdown margin requirement for Modes 3,4 & 5 operation to maintain existing shutdown margin requirements for Modes 1 & 2 operation. Fee paid.

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**Carolina Power & Light Company** 

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SERIAL: NLS-88-031 10CFR50.90

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

SHEARON HARRIS NUCLEAR POWER PLANT DOCKET NO. 50-400/LICENSE NO.NPF-63 REQUEST FOR LICENSE AMENDMENT BORON DILUTION/SLIDING SHUTDOWN MARGIN

Gentlemen:

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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 Shearon Harris Nuclear Power Plant (SHNPP).

To implement CP&L's fuel cycle strategies, the Company will begin to load higher enriched fuel in reduced leakage loading patterns for SHNPP Cycle 2. These improved fuel cycle strategies will necessitate a higher shutdown margin at the beginning of SHNPP Cycle 2 than required by the existing SHNPP Technical Specifications. Since shutdown margin requirements decrease with burnup, establishing the beginning of Cycle 2 value as the minimum required shutdown margin throughout the cycle would unduly restrict plant operation. The proposed amendment alleviates this problem by implementing a variable shutdown margin requirement for Mode 3, 4, and 5 operation while maintaining the existing shutdown margin requirements for Mode 1 and 2 operation. NRC has approved variable shutdown margins for facilities such as V. C. Summer, Vogtle, and the South Texas Project.

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

Enclosure 2 details the basis for the Company's determination that the proposed changes do not involve a significant hazards consideration.

Enclosure 3 provides the proposed Technical Specification pages.

In accordance with the requirements of 10CFR170.12, a check for \$150 is also enclosed.

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In order to avoid delays in the upcoming SHNPP refueling outage, CP&L requests that the proposed amendment be issued by June 1, 1988.

Please refer any questions regarding this submittal to Mr. Leonard I. Loflin at (919) 836-6242.

Yours very truly,

W.

LWE/MAT

Enclosures:

- 1. Basis for Change Request
- 2. 10CFR50.92 Evaluation
- 3. Technical Specification Pages

cc: Mr. Dayne H. Brown w/a Dr. J. Nelson Grace w/a Mr. G. F. Maxwell w/a Mr. B. C. Buckley w/a

L. W. Eury, 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.

My commission expires: ///27/89

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## ENCLOSURE 1

# SHEARON HARRIS NUCLEAR POWER PLANT NRC DOCKET NO. 50-400 OPERATING LICENSE NPF-63 REQUEST FOR LICENSE AMENDMENT

# BASIS FOR CHANGE REQUEST BORON DILUTION/SLIDING SHUTDOWN MARGIN

### Proposed Change

The proposed amendment modifies the shutdown margin requirements of Technical Specification Section 3/4.1.1. The current Technical Specifications require a fixed value for shutdown margin for a given mode of operation. The revised Technical Specifications implement a variable shutdown margin as a function of RCS boron concentration for a given mode of operation. NRC has approved variable shutdown margin previously for facilities such as V. C. Summer, Vogtle, and the South Texas Project. Due to the higher shutdown margin required at the beginning of SHNPP Cycle 2, the minimum fluid volume requirements for the boric acid tank and the refueling water storage tank specified in Technical Specifications 3.1.2.5 and 3.1.2.6 have been increased. The addition of a new figure in the Technical Specifications necessitates administrative changes affecting the designation of the Rod Group Insertion Limits Versus Thermal Power figure and associated references.

#### <u>Basis</u>

Shutdown margin is defined in the Technical Specifications as: "the instantaneous amount of reactivity by which the reactor is subcritical or would be subcritical from its present condition assuming all rod cluster assemblies (shutdown and control) are fully inserted except for the single rod cluster assembly of highest reactivity worth which is assumed to be fully withdrawn". Maintaining sufficient shutdown margin ensures that: (1) the reactor can be made subcritical from any operating condition; (2) the reactivity transients associated with postulated accident conditions are controllable within acceptable limits, and (3) the reactor will be maintained subcritical to preclude inadvertent criticality in the shutdown mode.

Shutdown margin requirements are determined based on postulated reactivity transients. The limiting transients for shutdown margin determination are Main Steamline Break (MSLB) and Inadvertent Boron Dilution (IBD) depending on the mode of operation. In Modes 3, 4, and 5, the most restrictive condition occurs at beginning-of-cycle (BOC), when the boron concentration is the greatest. In these Modes, the required shutdown margin is composed of a constant requirement and a variable requirement, which is a function of the RCS boron concentration. The constant shutdown margin requirement is based on an uncontrolled RCS cooldown from a steamline break accident, as is the case for Modes 1 and 2. The variable shutdown margin requirement is based on the results of boron dilution accident analyses, where the shutdown margin is varied as a function of RCS boron concentration, to · guarantee a minimum of 15 minutes for operator action prior to a loss of shutdown margin.

Technical Specifications 3.1.1.1 and 3.1.1.2 establish shutdown margin requirements which maintain sufficient shutdown margin to satisfy the above criteria. Currently, Technical Specification 3.1.1.1 requires a shutdown margin of at least 1770 pcm (1.77% delta k/k) during Modes 1, 2, 3, and 4. This limit was established to provide adequate protection for the postulated MSLB accident. Technical Specification 3.1.1.2 currently requires a shutdown margin of 2000 pcm (2% delta k/k) while in Mode 5 to protect against an IBD event. Rod insertion limits (Technical Specification 3.1.3.6) ensure adequate negative reactivity to take the reactor subcritical from Modes 1 and 2, therefore, the variable shutdown margin is not applicable to these Modes.

The fixed shutdown margin requirements of the current SHNPP Technical Specifications will have an adverse impact on Cycle 2 operation. Due to higher boron concentrations at BOC for SHNPP Cycle 2, a higher shutdown margin requirement is necessary to provide adequate protection against an BOC IBD event. However, at end-of-cycle (EOC), the increase in dilution time due to lower boron concentrations results in a substantially lower shutdown margin requirement. The existing Technical Specifications would require the shutdown margin to be fixed at the higher BOC value throughout Cycle 2, even though the required shutdown margin decreases with core burnup. The proposed license amendment alleviates this problem by establishing a sliding shutdown margin requirement for Mode 3, 4, and 5 operation that takes credit for reduced EOC shutdown margin requirements.

As stated above, Technical Specification changes to the shutdown margin are not required for Modes 1 and 2. The Mode 3, 4, and 5 required shutdown margin is determined using the initial boron concentration in the RCS. The shutdown margin ensures that there is at least 15 minutes for the operator to terminate a dilution event. For Mode 5, this time is defined as the time from receipt of the High Flux at Shutdown Alarm (HFSA) to loss of shutdown margin. For Modes 3 and 4, operator action time is defined as the time from the beginning of the event until loss of shutdown margin. Figure 3.1-1 of the proposed change shows the required shutdown margin as a function of RCS boron concentration for Modes 3, 4, and 5. The Mode 3 and 4 curve is based on a filled RCS volume with at least one reactor coolant pump operating. This curve shows that the required shutdown margin is 2.28% at an RCS boron concentration of 2200 ppm. This decreases linearly to a 1.77% shutdown margin at 1500 ppm and remains fixed for lower concentrations, consistent with the existing SHNPP Technical Specifications. The curve for Mode 5 is based on operation with a partially drained RCS volume and shows that the required shutdown margin is 6.46% at an RCS boron concentration of 2200 ppm. This decreases linearly to a 1% shutdown

margin at 363 ppm and remains fixed at lower concentrations. For Mode 4, with no reactor coolant pumps in operation, the most restrictive curve will apply for a given boron concentration. It is expected that for Cycle 2 the maximum boron concentration necessary to meet the shutdown requirement for an IBD event at BOC will be less than 2000 ppm. To ensure that a boron concentration greater than 2000 ppm is not required, the setpoint for the HFSA, currently analyzed at 3.7 times background count rate for operation below 200 degrees F, has been reanalyzed at 2.1 times background. The setpoint for the HFSA will be conservatively changed to 2.0 times background.

The 2% shutdown margin for Mode 5, required by the current Technical Specification 3.1.1.2, was established to ensure that there is at least 15 minutes from HFSA indication to loss of shutdown margin (as required by Section 15.4.6 of the Standard Review Plan, NUREG-0800, Rev. 2) in the event of an IBD. The proposed sliding shutdown margin coupled with the revised HFSA meets this criterion and, as such, does not significantly reduce the margin of safety.

Due to the higher shutdown margin required at the beginning of SHNPP Cycle 2, CP&L has increased the minimum fluid volume requirements for the boric acid tank and the refueling water storage tank specified in Technical Specifications 3.1.2.5 and 3.1.2.6. The minimum borated water volumes were increased so that the required shutdown margin can be provided. As such, the proposed changes to the minimum tank volume requirements do not result in a reduction in the margin of safety.

The final change proposed in this license amendment revises the designation for the Rod Group Insertion Limits Versus Thermal Power figure from Figure 3.1-1 to Figure 3.1-2. The associated references to this figure have been changed accordingly. This change results from the addition of the new Figure 3.1-1, Shutdown Margin Versus RCS Boron Concentration, Modes 3, 4, and 5. This change is administrative in nature and, therefore, does not affect the margin of safety. The Rod Group Insertion Limits Versus Thermal Power figure reflects changes proposed in Enclosure 1 of our February 1, 1988 license amendment request.

Revisions to the Base's for Technical Specification Section 3/4.1, Reactivity Control Systems, which reflect the proposed license amendment have been included in Enclosure 3 for your information.

### ENCLOSURE 2

# SHEARON HARRIS NUCLEAR POWER PLANT NRC DOCKET NO. 50-400 OPERATING LICENSE NPF-63 REQUEST FOR LICENSE AMENDMENT

# <u>10CFR50,92 EVALUATION</u> BORON\_DILUTION/SLIDING\_SHUTDOWN\_MARGIN

The Commission has provided standards in 10CFR50.92(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. 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

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The proposed amendment modifies the shutdown margin requirements of Technical Specification Section 3/4.1.1. The current Technical Specifications require a fixed value for shutdown margin for a given mode of operation. The revised Technical Specifications implement a variable shutdown margin as a function of RCS boron concentration for a given mode of operation. Due to the higher shutdown margin required at the beginning of SHNPP Cycle 2, the minimum fluid volume requirements for the boric acid tank and the refueling water storage tank specified in Technical Specifications 3.1.2.5 and 3.1.2.6 have been increased. The addition of a new figure in the Technical Specifications necessitates administrative changes affecting the designation of the Rod Group Insertion Limits Versus Thermal Power figure and associated references.

#### <u>Basis</u>

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

1. The proposed amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated. The revision to the shutdown margin requirements established in Technical Specifications 3.1.1.1 and 3.1.1.2 does not increase the probability of an accident previously evaluated because it does not alter the method in which any safety related system performs its intended function. The proposed reduction in shutdown margin for operation in Mode 5 impacts only the Inadvertent Boron Dilution (IBD) event. The IBD event has been reanalyzed and it was determined that the proposed sliding shutdown margin coupled with the lowered High Flux at Shutdown Alarm (HFSA) maintains at least 15 minutes from alarm indication to loss of shutdown margin, as required by Section 15.4.6 of the Standard Review Plan, NUREG-0800, Rev. 2. Since the shutdown margin requirements for Mode 1, 2, 3, and 4 remain greater than or equal to those currently existing in the SHNPP Technical Specifications, the Main Steamline Break event is not affected by the revision to the shutdown margin requirements. Therefore, the revision to the shutdown margin requirements established in Technical Specifications 3.1.1.1 and 3.1.1.2 does not increase the consequences of a previously evaluated accident.

The increased minimum fluid volume requirements for the boric acid tank and the refueling water storage tank specified in Technical Specifications 3.1.2.5 and 3.1.2.6 do not alter the method in which any safety related system performs its intended function. Therefore, the revision to Specifications 3.1.2.5 and 3.1.2.6 does not involve a significant increase in the probability or consequences of an accident previously evaluated.

The revision to the designation for the Rod Group Insertion Limits Versus Thermal Power figure and associated references is administrative in nature and, as such, can not increase the probability or consequences of an accident previously evaluated.

- 2. The proposed amendment does not require the use of a new or different system than currently exists, nor does it require existing systems to perform functions which they were not intended to perform. Therefore, the proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated.
- 3. The proposed amendment does not involve a significant reduction in the margin of safety. The revision to the shutdown margin requirements established in Technical Specifications 3.1.1.1 and 3.1.1.2 has been reviewed and it was determined that the results of the SHNPP FSAR Chapter 15 analyses continue to meet the acceptance criteria. The proposed reduction in shutdown margin requirement for operation in Mode 5 impacts only the IBD event. The IBD event has been reanalyzed and it was determined that the proposed sliding shutdown margin coupled with the lowered HFSA maintains at least 15 minutes from alarm indication to loss of shutdown margin, as required by Section 15.4.6 of the Standard Review Plan, NUREG-0800, Rev. 2. Since the shutdown margin requirements for Mode 1, 2, 3, and 4 remain greater than or equal to those currently existing in the SHNPP Technical Specifications, the Main Steamline Break event is not affected by the revision to the shutdown margin requirements. Therefore, the revision to the

shutdown margin requirements established in Technical Specifications 3.1.1.1 and 3.1.1.2 does not involve a significant reduction in the margin of safety.

The increased minimum fluid volume requirements for the boric acid tank and the refueling water storage tank specified in Technical Specifications 3.1.2.5 and 3.1.2.6 do not alter the method in which any safety related system performs its intended function. The minimum borated water volumes were increased so that the required shutdown margin can be provided. Therefore, the revision to Specifications 3.1.2.5 and 3.1.2.6 does not involve a reduction in the margin of safety.

The revision to the designation for the Rod Group Insertion Limits Versus Thermal Power figure and associated references is administrative in nature and, as such, can not reduce the margin of safety.