#### DEMONSTRATION SYSTEM BUTION ACCELERATED DIST REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS) ACCESSION NBR:8908300052 DOC.DATE: 89/08/24 NOTARIZED: YES DOCKET # FACIL: 50-261 H.B. Robinson Plant, Unit 2, Carolina Power & Light C 05000261 AUTHOR AFFILIATION AUTH.NAME See RD T CUTTER, A.B. Carolina Power & Light Co. RECIP.NAME RECIPIENT AFFILIATION Document Control Branch (Document Control Desk) #ANF-88-054(P) R SUBJECT: Application for amend to License DPR-23,to revise Tech Specs to incorporate results of analyses using PDC-3 methodology. I SIZE: 54/19 DISTRIBUTION CODE: APOID COPIES RECEIVED:LTR | ENCL D TITLE: Proprietary Review Distribution - Operating Reactor S NOTES: COPIES RECIPIENT COPIES RECIPIENT LTTR ENCL ID CODE/NAME ID CODE/NAME LTTR ENCL A PD2-1 LA PD2-1 PD 1 1 1 1 LO,R 3 3 D

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#### Carolina Power & Light Company

P.O. Box 1551 • Raleigh, N.C. 27602

SERIAL: NLS-89-186

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A. B CUTTER Vice President Nuclear Services Department

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

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2 DOCKET NO. 50-261/LICENSE NO. DPR-23 REQUEST FOR LICENSE AMENDMENT POWER DISTRIBUTION CONTROL

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 (TS) for the H. B. Robinson Steam Electric Plant, Unit No. 2.

The proposal would incorporate the results of analyses using Advanced Nuclear Fuel's (ANF) new PDC-3 methodology. The PDC-3 methodology, using three dimensional analytical techniques, more explicitly models HBR2-specific core axial and radial power distributions thereby predicting a less restrictive V(Z) distribution, hence producing additional operational flexibility. The methodology and results are discussed in the attached reports: "PDC-3 Advanced Nuclear Fuels Corporation Power Distribution Control for Pressurized Water Reactors and Application of PDC-3 to H. B. Robinson Unit 2," ANF-88-054(P), July 1988 and ANF-88-054(NP), March 1989. The PDC-3 methodology was used in the design of the reload core for Cycle 14, accordingly approval of this proposed amendment is requested prior to startup for Cycle 14 currently scheduled for June 15, 1990. Approval of this proposed amendment will allow plant operators more flexibility to respond to transient and off normal conditions. The proposed change consists of replacement of TS Figures 3.10-4 and 3.10-5.

#### SIGNIFICANT HAZARDS ANALYSIS

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Carolina Power & Light Company has reviewed the subject TS change request in accordance with the standards set forth in 10CFR50.92 and determined that this change does not constitute a significant hazard based upon the following considerations.  $\Lambda$ 

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## A. Evaluation of Figure 3.10-4, V(Z) Curves

- 1. Would the operation of the facility involve a significant increase in the probability or consequences of an accident previously evaluated?
  - a. Operation of the reactor using the PDC-3 V(Z) curves illustrated in Figure 3.10-4 insures compliance with all previously established limitations assumed in Chapter 15 on power distribution. Specifically, the proposed V(Z) curves predict the potential increase in FQ(Z) due to normal routine, Technical Specification-allowed, core maneuvers and as a result of accumulated exposure effects.

As in the NRC-approved PDC-II methodology, application of V(Z) to the steady state values of FQ(Z) obtained via monthly flux maps, assures that the UFSAR Chapter 15 post-accident peak clad temperatures will not exceed 2200°F. Since implementation of the new PDC-3 V(Z) curves will not compromise compliance with limits on the maximum FQ(Z), the consequences of a previously evaluated accident will not be increased.

- b. Implementation of the PDC-3 V(Z) curves will involve no changes in equipment, systems, or setpoints used in determining the probability of an evaluated accident. Therefore, no increase in the probability of a previously evaluated accident will result.
- 2. <u>Would the operation of the facility create the possibility of a new</u> or different kind of accident from any accident previously evaluated?

Implementation of the PDC-3 V(Z) curves will not allow operation of the plant outside any of the parameters or conditions assumed in UFSAR Chapter 15 analyses. No changes in equipment, systems, or setpoints designed to prevent and/or mitigate accidents will be made. Also, no changes in the plant design basis are made. Therefore, the possibility of a new or different kind of accident is not created.

3. <u>Would the operation of the facility involve a significant reduction</u> in the margin of safety?

The margins to safety are defined by TS limits on power distribution, specifically FQ(Z), as developed by Chapter 15 safety analysis. The V(Z) curves currently in the TSs were developed using the NRC-approved PDC-2 methodology; the proposed V(Z) curves were developed using PDC-3 methodology. The differences in the two PDC versions is due to the analytic method of generating data. PDC-2 is based on synthesis of 1-D axial and radial power distributions while PDC-3 is based upon 3-D simulations of core power distributions. Additionally, PDC-2 is based on evaluations of the behavior of a generic PWR core. The results were determined to bound H. B. Robinson. The proposed PDC-3 curves were generated by a plant-specific analysis and the conservatisms necessary to make PDC-2 generic were not included in PDC-3. Document Control Desk NLS-89-186 / Page 3

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As a result of these differences, the PDC-2 V(Z) curves were found to over predict the potential increases in FQ(Z) during allowed core maneuvers. The over predictions prevent the use of available operating margin and, therefore, could unnecessarily restrict plant operations. Quantitatively, the PDC-3 V(Z) penalties in the central and upper axial regions of the core will be reduced by about 3.5% for the +5% axial flux difference bands and by 2.5% to 3.0% for the +3% bands. This reduction in penalty allows for greater utilization of the +5% axial flux difference bands which will provide improved capability to respond to plant transient and off normal behavior.

Since the PDC-3 V(Z) curves are less restrictive than the PDC-2 V(Z) curves, an expanded set of core transient maneuvers (relative to PDC-2) was used to develop the new curves. This expanded set was run to insure the less restrictive curve remained conservative relative to the margin of safety.

As a direct result of the reduction in penalties, PDC-3 will allow operation with slightly higher total peaking factors (relative to PDC-2) during steady state operation. However, the power distribution limitations provided by PDC-3 insure compliance with the 2.32 power adjusted Technical Specification limit on total peaking factor FQ(Z) during all allowed plant manuevers. Since PDC-3 is related to LOCA analyses through the total peaking factor limit, and since PDC-3 continues to show compliance with the present thermal limits, the existing Chapter 15 LOCA analyses remain valid. This provides the basis for the determination that the margin of safety has not been significantly reduced.

- B. Evaluation of Figure 3.10-5, Target Flux Difference
  - 1. Would the operation of the facility involve a significant increase in the probability or consequences of an accident previously evaluated?
    - a. PDC-3 procedures, like PDC-2, allow operation outside the +3 or +5% bands for a limited amount of time for power levels at 90% or below. The increased operational flexibility is due to the increase in TS FQ(Z) limits as power decreases. For power levels between 50 and 90% (inclusive), the deviation outside the target bands is defined by the "doghouse" curves illustrated in Figure 3.10-5. The magnitudes of the allowed variations are set so that the resulting reduced power V(Z) curves are still bounded by the full power curves, that is, the expected increases in FQ(Z) at lower power levels are bounded by the expected increases at full power. These variations are necessarily determined for both the +3% and +5% bands. Consistent with current TSs, operation outside the target bands is limited to one hour cumulative in any 24-hour period, after which corrective actions are required. The one-hour time limit is imposed to preserve the equilibrium xenon distribution and avoid axial xenon oscillations which may induce power distribution oscillations that cause unacceptable peaking.

1.4%

As with the V(Z) curves, Figure 3.10-5 was developed using the 3-D XTG Nodal Simulator, the expanded set of core transient maneuvers, and the specific characteristics of H. B. Robinson as opposed to a generic plant. Also, since the Chapter 15 analyses define the thermal peaking margins to safety, and the limitations on variations outside the target bands insure compliance with thermal limits, the consequences of an accident previously evaluated will not be increased.

b. Implementation of PDC-3 Figure 3.10-5 will involve no changes in equipment, systems, or setpoints used in determining the probability of an evaluated accident. Therefore, no increase in the probability of a previously evaluated accident will occur.

## 2. <u>Would the operation of the facility create the possibility of a new</u> or different kind of accident from any accident previously evaluated?

Implementation of the PDC-3 Figure 3.10-5 curves will not allow operation of the plant outside any of the parameters or conditions assumed in Chapter 15 analyses, particularly those dealing with power distribution limitations. No changes in equipment, systems or setpoints designed to prevent and/or mitigate accidents will be made. Also, no changes in the plant design basis are made. Therefore, the possibility of a new or different kind of accident is not created.

## 3. <u>Would the operation of the facility involve a significant reduction</u> in the margin of safety?

The curves illustrated in Figure 3.10-5 were developed using the improved PDC-3 methodology described earlier. The margins to safety are defined by Chapter 15 analyses related to power distribution and are defined in terms of thermal peaking limits, specifically FAH and FQ(Z). PDC-3 methodology is designed to insure compliance with FQ(Z) limits by controlling the variation in axial offset about a target, thus controlling the axial power distribution, and by preserving the equilibrium axial xenon distribution, to prevent localized power perturbations. Compliance with FAH limits is controlled by TSs unrelated to PDC-3.

At power levels at and below 90% additional flexibility in plant operations beyond the target bands is needed to allow for tests and calibrations. The "doghouse" curves in Figure 3.10-5 provide this flexibility while limiting its duration. In Figure 3.10-5, the maximum allowable deviations outside the target bands are illustrated for both the  $\pm 3\%$  and  $\pm 5\%$  target bands. Basically, the curves indicate that axial flux differences outside the target bands, but within the "doghouse" curves, will not result in unacceptable axial power distributions and will not initiate unacceptable xenon oscillations if the AFD is returned to the target bands within one hour. Note that thermal limits on FQ(Z) increase with decreasing power and that the one-hour time limit is cumulative for any 24-hour period. Document Control Desk NLS-89-186 / Page 5

> Since the curves in Figure 3.10-5 insure compliance with FQ(Z) limits as defined in Chapter 15, they were developed with improved PDC-3 analyses, and they are based on PDC-3 V(Z) curves, which were shown not to significantly reduce the margin of safety, no significant reductions in the margins to safety will occur because of their implementation.

#### ADMINISTRATIVE

ANF considers the information contained in the reference topical report to be proprietary. In accordance with the Commission's Regulation 10CFR2.790(b), the enclosed affidavit executed by Mr. H. E. Williamson of ANF provides the necessary information to support withholding of this topical report from public disclosure.

The TS pages reflecting the proposed changes are provided for your use.

If you have any questions concerning this request, please contact Mr. L. I. Loflin at (919) 546-6242.

Yours werv truk

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Enclosure

Mr. S. D. Ebneter cc: Mr. L. Garner (NRC - HBR) Mr. R. Lo Mr. Heyward G. Shealy (SC) Attorney General (SC)

A. B. Cutter, 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.

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My commission expires: (-7-93)