February 9, 1990

Docket No. 50-261

DISTRIBUTION
See attached page

Mr. Lynn W. Eury
Executive Vice President
Power Supply
Carolina Power & Light Company
Post Office Box 1551
Raleigh, North Carolina 27602

Dear Mr. Eury:

SUBJECT: ISSUANCE OF AMENDMENT NO.125 TO FACILITY OPERATING LICENSE NO. DPR-23 - H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2, REGARDING INCREASED FUEL ENRICHMENT (TAC NO. 74372)

The Nuclear Regulatory Commission has issued the enclosed Amendment No.125 to Facility Operating License No. DPR-23 for the H. B. Robinson Steam Electric Plant, Unit No. 2. This amendment consists of changes to the Technical Specifications in response to your request dated August 4, 1989, as supplemented November 18, 1989.

The amendment consists of changes to the Technical Specifications to increase the allowable fuel enrichment in the reactor, the new fuel storage racks and the spent fuel storage pit from 3.9 weight percent (w/o) to 4.2 plus 0.05 (nominal 4.2) w/o.

A copy of the related Safety Evaluation is enclosed. A Notice of Issuance will be included in the Commission's next regular bi-weekly Federal Register notice.

Sincerely,

Original Signed By:

Ronnie H. Lo, Senior Project Manager
Project Directorate II-1
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosures:
1. Amendment No.125 to DPR-23
2. Safety Evaluation

cc w/enclosures:
See next page

OFC	:LA:PD21:DRPR	:PM:PD21:DRPR	:D:PD21:DRPR	:	:	:	:
NAME	: PAnderson	: RLo:sw	: EAdensam	:	:	:	:
DATE	:1/25/90	:1/25/90	:2/9 /90	:	:	:	:

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Mr. L. W. Eury
Carolina Power & Light Company

H. B. Robinson Steam Electric
Plant, Unit No. 2

cc:
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South Carolina Department of Health
and Environmental Control
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Columbia, South Carolina 29201

AMENDMENT NO. 125 TO FACILITY OPERATING LICENSE NO. DPR-23 - ROBINSON, UNIT NO. 2

Docket File
NRC PDR
Local PDR
PDII-1 Reading
S. Varga (14E4)
G. Lainas
E. Adensam
P. Anderson
R. Lo
OGC
D. Hagan (MNBB 3302)
E. Jordan (MNBB 3302)
G. Hill (4) (P1-137)
W. Jones (P-130A)
J. Calvo (11D3)
D. Fieno
ACRS (10)
GPA/PA
ARM/LFMB

cc: Licensee/Applicant Service List

CAROLINA POWER & LIGHT COMPANY

DOCKET NO. 50-261

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 125
License No. DPR-23

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Carolina Power & Light Company (the licensee), dated August 4, 1989, as supplemented November 18, 1989, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications, as indicated in the attachment to this license amendment; and paragraph 3.B of Facility Operating License No. DPR-23 is hereby amended to read as follows:

(B) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 125 , are hereby incorporated in the license. Carolina Power & Light Company shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Original Signed By:

E. G. Tourigny, Acting Director
Project Directorate II-1
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: February 9, 1990

OFC	LA:PD21:DRPR	PM:PD21:DRPR	OGC	D:PD21:DRPR			
NAME	PAnderson	RLo:	1-30-90	EAdensam			
DATE	1/24/90	1/24/90		2/7			

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ATTACHMENT TO LICENSE AMENDMENT NO. 125

FACILITY OPERATING LICENSE NO. DPR-23

DOCKET NO. 50-261

Replace the following pages of the Appendix A Technical Specifications with the enclosed pages. The revised areas are indicated by marginal lines.

Remove Pages	Insert Pages
5.3-1	5.3-1
5.4-1	5.4-1
5.4-2	5.4-2

5.3 REACTOR

5.3.1 REACTOR CORE

5.3.1.1 The reactor core contains approximately 68 metric tons of uranium in the form of natural or slightly enriched uranium dioxide pellets. The pellets are encapsulated in Zircaloy-4 tubing to form fuel rods which are all pre-pressurized. The reactor core is made up of 157 fuel assemblies. Each fuel assembly contains 204 fuel rod locations occupied by rods consisting of natural or slightly enriched uranium pellets, solid inert materials, or a combination of the aforementioned.(1)

5.3.1.2 Deleted

5.3.1.3 Reload fuel will be similar in physical design to the initial core. The enrichment of reload fuel will be no more than 4.2 + 0.05 (nominal 4.2) weight percent of U-235.

5.3.1.4 Deleted

5.3.1.5 There are 45 full-length RCC assemblies in the reactor core. The full-length RCC assemblies contain 144-inch segments of silver-indium-cadmium alloy clad with stainless steel.(2)

5.3.1.6 Deleted

5.3.2 REACTOR COOLANT SYSTEM

5.3.2.1 The design of the Reactor Coolant System complies with the code requirements.(3)

5.4 FUEL STORAGE

5.4.1 SPENT FUEL PIT

The new and spent fuel pit structures are designed to withstand the anticipated earthquake loadings as Class I structures. The spent fuel pit has a stainless steel liner to ensure against loss of water.[1]

5.4.2 CRITICALITY

5.4.2.1 NEW FUEL STORAGE RACKS

Due to the new fuel storage rack design, a nominal 21-inch center-to-center distance is maintained between fuel assemblies. To permit storage of fuel with a maximum assembly axial plane enrichment of 4.2 + 0.05 (nominal 4.2) weight percent U-235, additional separation is maintained by use of any of the storage rack location options below[2][4] in order to establish a geometry which ensures that k_{eff} is less than 0.95 assuming the new fuel storage racks are flooded with unborated water and which assures that k_{eff} is less than 0.98 in an optimum moderation event.

The four listed options provide fuel storage locations which are secured to prevent fuel storage in those locations.

OPTION A: B4,6,8,10 / C3,5,7,9 / D4,6,8,10 E3,5,7,9 / F4,6,8,10 / G3,5,7,9
H4,6,8,10 / J3,5,7,9

OPTION B: C4,5,6,7,8,9 / D4,5,6,7,8,9 / E4,5,6,7,8,9 / F4,5,6,7,8,9
G4,5,6,7,8,9 / H4,5,6,7,8,9

OPTION C: C4,5,6,7,8,9 / D4,5,6,7,8,9 / E4,5,8,9 / F4,5,8,9 / G4,5,6,7,8,9
H4,5.6.7,8,9

OPTION D: C4,5,6,7,8,9 / D4,5,8,9 / E4,5.8,9 / F1,4,5,3,9 / G1,4,5,8,9
H1,4,5.6.7.3,9 / J1 / K1

5.4.2.2 SPENT FUEL STORAGE PIT

A combination of nominal assembly spacing and neutron absorbent material between stored assemblies is maintained to ensure that k_{eff} is less than 0.95 when flooded with unborated water based on a maximum assembly axial plane enrichment of 4.2 + 0.05 (nominal 4.2) weight percent U-235.[4]

5.4.3 BORON CONCENTRATION - SPENT FUEL STORAGE PIT

The spent fuel storage pit is filled with borated water at a concentration of greater than or equal to 1500 ppm during refueling operations or new fuel movement in the spent fuel storage pit. This minimum boron concentration ensures subcriticality under worst case design events.

5.4.4 STORAGE CAPACITY - SPENT FUEL STORAGE PIT

The spent fuel storage pit provides a storage location for 544 fuel assemblies.

<u>Reference</u>

(1) FSAR Section 9.1

(2) XN-NF-86-100, "Final Report, Criticality Safety Analysis, H. B. Robinson New Fuel Storage Vault with 4.2 Percent Enriched 15 x 15 Fuel Assemblies, September, 1986 and Addendum 1 to XN-NF-86-100, January 1"

(3) XN-NF-86-107, "Final Report, Criticality Safety Analysis, H. B. Robinson Spent Fuel Storage Racks (Unpoisoned, Low Density) with 4.2% Enriched 15 x 15 Fuel Assemblies," September 1986

(4) ANF-89-017, "Criticality Safety Analysis of the H. B. Robinson Spent Fuel Pool with 4.2% Nominal Enrichment Fuel Assemblies, January 1989."

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 125 TO FACILITY OPERATING LICENSE NO. DPR-23

CAROLINA POWER & LIGHT COMPANY

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2

DOCKET NO. 50-261

1.0 INTRODUCTION

By letters dated August 4, 1989 and November 18, 1989, the Carolina Power & Light Company (CP&L), the licensee, requested a change to the Technical Specifications of Facility Operating License No. DRP-23 that would change Specifications 5.3.1.3, 5.4.2.1, and 5.4.2.2. for H.B. Robinson Steam Electric Plant, Unit No. 2 (Robinson 2). The proposed changes would permit the reload of fuel assemblies with enrichments up to 4.20 + .05 (nominal 4.2) weight percent (w/o) Uranium-235 and the storage of such fuel assemblies prior to and subsequent to loading in the Robinson 2 reactor.

2.0 EVALUATION

The licensee had previously requested an enrichment increase to 3.9 w/o Uranium-235 for fuel assemblies stored in the new fuel storage racks and the unpoisoned, low density spent fuel storage racks (Reference 1). The poisoned, high density spent fuel storage racks were already licensed to permit the storage of fuel assemblies having an enrichment of 3.9 w/o Uranium-235. The analyses contained in References 2 and 3 supported, however, the storage of fuel assemblies with an enrichment of 4.2 w/o Uranium-235 for the new fuel storage racks and the unpoisoned, low density spent fuel storage racks, respectively. The NRC approved the license request upon revision of one of the proposed changes to specifically designated acceptable fuel storage locations in the new fuel storage racks. The NRC issued a Safety Evaluation (SE) on these changes on January 20, 1987. Thus, our review will be based on the previous submittals, analyses, and SE, as well as on the present submittal and analyses.

The analyses supporting the proposed changes to the Technical Specifications for 4.20 + .05 w/o enrichment fuel for the new fuel storage racks are presented in References 2 and 5. The reports describe the model used for the new fuel storage rack and analysis, the assumed input parameter values, the methods used for the analysis, and some of the results of the methods verification.

The values of fuel parameters selected for the analysis were chosen in the conservative direction. Thus, fuel pellet density was chosen to be slightly greater than the design value, the fuel pellet dish volume was neglected, and the fuel stack length was taken as 144 inches whereas the fuel design stack length is 132 inches (enriched). There is a minimum of 12 inches of natural uranium in all fuel rods. Most importantly, no Gd_2O_3 content was assumed in the model fuel. Nominal values were used for remaining fuel geometry and composition parameters. Because of the conservative assumptions indicated above, we conclude the fuel model used in the calculations is acceptable.

Conservative assumptions were made concerning the fuel storage rack, geometry and composition. The model storage rack pitch is 20.857 inches, whereas the actual rack value is nominally 21 inches. The rack was relfected with 30 cm of concrete at the 4 walls, the floor and at 14 feet above the ceiling. All rack materials of construction were neglected in the model. Thus, the model is conservative in geometry, reflection and neutron absorption effects and is, therefore, acceptable.

The calculation methods used KENO-IV or XSDRNPM for k_{inf} and k_{eff} calculations. The calculation methods used CASMO-3 to evaluate the effect of the fuel enrichment tolerance on k_{eff}. Suitable cross section libraries were used. The report presents the results of comparison of the criticality factors for four sets of critical experiments. The results show good agreement with the measured criticalities. We, therefore, conclude that the calculation model used is acceptable.

The calculation of the actual new fuel vault criticality with fuel bundles modeled in all 105 locations indicated that the criterion of k_{eff} less than or equal to 0.98 with optimum moderation of the fuel rack would not be met. This criterion and one requiring k_{eff} to be less than or equal to 0.95 for the rack fully flooded (or for the worst credible accident) must be met according to the Standard Review Plan, NUREG-0800. In view of unacceptability of the criticality of the new fuel storage racks when fully loaded, the reports present the results of four alternative loadings of fuel in the rack with empty locations interspersed between fuel locations. These allow loading of 69-73 fuel bundles.

The alternative loading patterns all show an acceptable k_{eff} for optimum moderation. Based on the previous staff SE (Reference 4), the licensee must physically block prohibited locations of the specific array used to ensure conformance with the optimum moderation criticality requirements. The most reactive option had a k_{eff} of 0.961 with an uncertainty of ± 0.0056. The least reactive option had a k_{eff} of 0.897 with the uncertainty of ± 0.0053. Thus, the staff criterion that the new fuel storage racks must have a k_{eff} less than or equal to 0.98 with all uncertainties included at a 95/95 probability/confidence level for the optimum moderation condition is easily met for a fuel enrichment of 4.20 w/o Uranium-235 with a manufacturing tolerance of + .05 w/o.

At flooded conditions with full density water the k_{eff} of an infinite array of fuel assemblies is 0.917 with an uncertainty of ± 0.006. Thus the staff criterion that the new fuel storage racks must have a k_{eff} less than 0.95, with all uncertainties included at a 95/95 probability/confidence level for the fully flooded condition, is met for a fuel enrichment of 4.20 w/o Uranium-235 with a manufacturing tolerance of + .05 w.o. This result for an infinite array will be conservative for the different fuel loading options.

Based on the consideration discussed above, we conclude that the storage of fuel with an enrichment of 4.20 + 0.05 w/o Uranium-235 in the new fuel storage racks is acceptable provided that the unused locations of the acceptable storage array that is used are physically blocked. Because the licensee's analyses show that k_{eff} can increase as the water to fuel volume ratio increases, removal of fuel rods from any fuel assembly stored in the new fuel storage racks is not permitted.

References 3 and 6 provide the results of criticality analyses of the low density (unpoisoned) and high density (poisoned) spent fuel storage racks, respectively. The criticality analyses are for a maximum fuel enrichment of 4.20 + 0.05 w/o Uranium-235. The conservative assumptions concerning fuel and storage and rack geometry described above for the new fuel storage rack calculations were also used for the spent fuel storage rack calculations, except that the more conservative assumption of an infinite array of infinite length assemblies was used for the spent fuel storage rack calculations. In addition, the analysis of the high density (poisoned) spent fuel storage racks includes a conservative assumption on the dimensional changes of the Boraflex neutron absorber sheets. The same computer codes were also used. The results indicate that the maximum k_{eff} for the high density (poisoned) spent fuel storage racks, including conservative allowances for uncertainties, is 0.919. For the low density (unpoisoned) spent fuel storage racks, the results indicate that the maximum k_{eff}, including conservative allowances for uncertainties, is 0.93. Thus, the staff criterion that both types of spent fuel storage racks must have a k_{eff} less than or equal to 0.95, with all uncertainties at a 95/95 probability/confidence level, is met for the spent fuel pool containing pure water at full density.

A spectrum of accidents was evaluated in Reference 4 which shows that the above result for the low density (unpoisoned) storage rack is limiting, except for closer edge-to-edge fuel assembly placement during a fuel handling accident. The analysis shows that a minimum boron concentration of 500 ppm during fuel handling will prevent exceeding the criterion of k_{eff} equal to or less than 0.95. For these accident analyses, credit for the solution boron in the spent fuel pool water is allowed. The Robinson 2 Technical Specification 5.4.3 (Boron Concentration-Spent Fuel Storage Pit), which requires a boron concentration of 1500 ppm during refueling operations or new fuel movement in the spent fuel storage pool, is more conservative than the value used in the analysis and, therefore, is acceptable.

Based on considerations discussed above, we conclude that the storage of fuel with an enrichment of 4.20 + 0.05 w/o Uranium-235 is acceptable for both the high density (poisoned) and low-density (unpoisoned) spent fuel storage racks provided that the boron concentration of the spent fuel pool is maintained at least equal to or greater than 500 ppm.

The changes to Technical Specifications 5.4.2.1 and 5.4.2.2 to an enrichment of 4.20 + 0.05 w/o Uranium-235 are acceptable for the new and spent fuel storage racks, respectively, based on the evaluation discussed above. The change to Specification 5.3.1.3 is acceptable because it merely indicates that fuel enrichments up to 4.20 + 0.05 w/o Uranium-235 can be used in the core design. Determination of the acceptability of an actual core design must be verified in the calculation of physics parameters and transients and accidents in the reload design evaluation.

3.0 SUMMARY

Based on the review described above, we conclude that the proposed Technical Specification modifications are acceptable from a criticality aspect and that fuel assemblies having initial enrichments up to 4.20 + 0.05 weight percent uranium-235 may be safely stored in the new and spent (poisoned and unpoisoned) fuel storage racks. This conclusion is based on: (1) physical blockage of the unused locations of the new fuel storage option used and (2) the maintenance of a least 500 ppm of boron in the spent fuel pool water (Specification 5.4.3 requires a concentration of 1500 ppm).

4.0 ENVIRONMENTAL CONSIDERATION

Pursuant to 10 CFR 51.21, 51.32, and 51.35, an environmental assessment and finding of no significant impact have been prepared and published in the Federal Register on December 13, 1989 (54 FR 51253). Accordingly, based upon the environmental assessment, the Commission has determined that the issuance of these amendments will not have a significant effect on the quality of the human environment.

5.0 CONCLUSION

The Commission made a proposed determination that this amendment involves no significant hazards consideration, which was published in the FEDERAL REGISTER (54 FR 51253) on December 13, 1989, and consulted with the State of South Carolina. No public comments or requests for hearing were received, and the State of South Carolina did not have any comments.

The Staff has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

6.0 REFERENCES

1. Letter from A.B. Cutter (CP&L) to L.S. Rubenstein (NRC), dated October 13, 1986.

2. "Final Report, Criticality Safety Analysis, H.B. Robinson New Fuel Storage Vault with 4.2 Percent Enriched 15 x 15 Fuel Assemblies," Exxon Report No. XN-NF-86-100, September 1986.

3. "Final Report, Criticality Safety Analysis, H.B. Robinson Spent Fuel Storage Rack (Unpoisoned, Low Density) with 4.2 Percent Enriched 15 x 15 Fuel Assemblies," Exxon Report No. XN-NF-86-107, September 1986.

4. Letter from Glode Requa (NRC) to E.E. Utley (CP&L), dated January 20, 1987.

5. "H.B. Robinson New Fuel Storage Vault With 4.2% Nominal Enriched Fuel Assemblies," XN-NF-86-100, Addendum 1, January 1, 1989.

6. "Criticality Safety Analysis of the H.B. Robinson Spent Fuel Pool With 4.2% Nominal Enrichment Fuel Assemblies," Advanced Nuclear Fuels Corporation Report No. ANF-89-017, January 25, 1989.

Principal Contributors: D. Fieno
R. Lo

Dated: February 9, 1990