December 30, 1991

Docket Nos. 50-348
and 50-364

DISTRIBUTION
See attached sheet

Mr. W. G. Hairston, III
Senior Vice President
Southern Nuclear Operating
Company, Inc.
Post Office Box 1295
Birmingham, Alabama 35201

Dear Mr. Hairston:

SUBJECT: ISSUANCE OF AMENDMENT NO. 91 TO FACILITY OPERATING LICENSE NO. NPF-2 AND AN AMENDMENT NO. 84 TO FACILITY OPERATING LICENSE NO. NPF-8 INCREASE IN RELOAD FUEL ENRICHMENT - JOSEPH M. FARLEY NUCLEAR PLANT, UNITS 1 AND 2, (TAC NOS. M80893 AND M80894)

The Nuclear Regulatory Commission has issued the enclosed Amendment No. 91 to Facility Operating License No. NPF-2 and Amendment No. 84 to Facility Operating License No. NPF-8 for the Joseph M. Farley Nuclear Plant, Units 1 and 2. The amendments change the Technical Specifications in response to your submittal, dated July 1, 1991, as supplemented October 18, 1991.

The amendments change the Technical Specifications to increase enrichment to a nominal 5.0 weight percent U-235 for optimized fuel assemblies (OFA) and for VANTAGE-5 fuel assemblies, taking credit for the presence of integral fuel burnable absorbers.

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

Sincerely,

Orignal signed by:

Stephen T. Hoffman, Project Manager
Project Directorate II-1
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosures:
1. Amendment No. 91 to NPF-2
2. Amendment No. 84 to NPF-8
3. Safety Evaluation

cc w/enclosures:
See next page

0700023

*SEE PREVIOUS CONCURRENCE

OFC	:LA:PD21:DRPE	:PE:PD21:DRPE	:PM:PD21:DRPE	:OGC	:D:PD21:DRPE	:	:
NAME	:PAnderson	:MWebb:db	:SHoffman	:AHodgdon*	:EAdensam	:	
DATE	:12/ /91	:12/30/91	:12/30/91	:12/18/91	:12/20/91	:	:

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Document Name: FARLEY AMEND 80893/94

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AMENDMENT NO. 91 TO FACILITY OPERATING LICENSE NO. NPR-2 - FARLEY, UNIT 1
AMENDMENT NO. 84 TO FACILITY OPERATING LICENSE NO. NPF-8 - FARLEY, UNIT 2

Docket File
NRC PDR
Local PDR
PDII-1 Reading
S. Varga (14E4)
E. Adensam
P. Anderson
S. Hoffman(2)
OGC
D. Hagan (MNBB 3302)
E. Jordan (MNBB 3302)
G. Hill (4) (P1-37)
Wanda Jones (P-130A)
C. Grimes (11D3)
ACRS (10)
GPA/PA
OC/LFMB
L. Reyes, RII

cc: Farley Service List

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

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

DOCKET NO. 50-348

JOSEPH M. FARLEY NUCLEAR PLANT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 91
License No. NPF-2

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

   A. The application for amendment by Alabama Power Company* dated July 1, 1991, as supplemented October 18, 1991, 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 license 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 2.C.(2) of Facility Operating License No. NPF-2 is hereby amended to read as follows:

* Subsequent to these submittals, Amendment No. 90 to Facility Operating License NPF-2 was issued authorizing Southern Nuclear Operating Company, Inc., (Southern Nuclear), to become the licensed operator. This change was implemented on December 23, 1991.

ATTACHMENT TO LICENSE AMENDMENT NO. 91

TO FACILITY OPERATING LICENSE NO. NPF-2

DOCKET NO. 50-348

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
5-6	5-6
5-7	5-7

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 91 , are hereby incorporated in the license. Southern Nuclear shall operate the facility in accordance with the Technical Specifications.

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

FOR THE NUCLEAR REGULATORY COMMISSION

Elinor G. Adensam

Elinor G. Adensam, 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: December 30, 1991

5.3 REACTOR CORE

FUEL ASSEMBLIES

5.3.1 The reactor core shall contain 157 fuel assemblies with each fuel assembly containing 264 fuel rods clad with Zircaloy-4. Each fuel rod shall have a nominal active fuel length of 144 inches. The initial core loading shall have a maximum nominal enrichment of 3.15 weight percent U-235. Reload fuel shall be similar in physical design to the initial core loading and shall have a maximum nominal enrichment of 4.25 weight percent U-235 for Westinghouse LOPAR fuel and a maximum nominal enrichment of 5.0 weight percent U-235 for Westinghouse OFA and VANTAGE-5 fuel. Westinghouse OFA and VANTAGE-5 fuel with maximum nominal enrichments greater than 3.9 weight percent U-235 shall contain sufficient integral burnable absorbers such that the requirements of specifications 5.6.1.1.c and 5.6.1.2.c are met. Westinghouse LOPAR fuel does not require integral burnable absorbers.

CONTROL ROD ASSEMBLIES

5.3.2 The reactor core shall contain 48 full length and no part length control rod assemblies. The full length control rod assemblies shall contain a nominal 142 inches of absorber material. The nominal values of absorber material shall be 80 percent silver, 15 percent indium and 5 percent cadmium. All control rods shall be clad with stainless steel tubing.

5.4 REACTOR COOLANT SYSTEM

DESIGN PRESSURE AND TEMPERATURE

5.4.1 The reactor coolant system is designed and shall be maintained:

a. In accordance with the code requirements specified in Section 5.2 of the FSAR, with allowance for normal degradation pursuant to the applicable Surveillance Requirements,

b. For a pressure of 2485 psig, and

c. For a temperature of 650°F, except for the pressurizer which is 680°F.

VOLUME

5.4.2 The total water and steam volume of the reactor coolant system is 9723 ± 100 cubic feet at a nominal T_{avg} of 525°F.

5.5 METEOROLOGICAL TOWER LOCATION

5.5.1 The meteorological tower shall be located as shown on Figure 5.1-1.

5.6 FUEL STORAGE

CRITICALITY

5.6.1.1 The spent fuel storage racks are designed and shall be maintained with a K_{eff} less than or equal to 0.95 when flooded with unborated water, which includes conservative allowances for uncertainties and biases. This is assured by maintaining:

a. A nominal 10.75 inch center-to-center distance between fuel assemblies placed in the storage racks.

b. A maximum nominal enrichment of 4.25 weight percent U-235 for Westinghouse LOPAR fuel assemblies.

c. A maximum reference fuel assembly K_∞ less than or equal to 1.455 at 68°F for Westinghouse OFA and VANTAGE-5 fuel assemblies.

5.6.1.2 The new fuel pit storage racks are designed and shall be maintained with a K_{eff} less than or equal to 0.98, assuming aqueous foam moderation. This is assured by maintaining:

a. A nominal 21 inch center-to-center distance between new fuel assemblies placed in the storage racks.

b. A maximum nominal enrichment of 4.25 weight percent U-235 for Westinghouse LOPAR fuel assemblies.

c. A maximum reference fuel assembly K_∞ less than or equal to 1.455 at 68°F for Westinghouse OFA and VANTAGE-5 fuel assemblies.

DRAINAGE

5.6.2 The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 149.

CAPACITY

5.6.3 The spent fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than 1407 fuel assemblies.

5.7 COMPONENT CYCLIC OR TRANSIENT LIMIT

5.7.1 The components identified in Table 5.7-1 are designed and shall be maintained within the cyclic or transient limits of Table 5.7-1.

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

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

DOCKET NO. 50-364

JOSEPH M. FARLEY NUCLEAR PLANT, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 84
License No. NPF-8

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

   A. The application for amendment by Alabama Power Company* dated July 1, 1991, as supplemented October 18, 1991, 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 license 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 2.C.(2) of Facility Operating License No. NPF-8 is hereby amended to read as follows:

* Subsequent to these submittals, Amendment No. 83 to Facility Operating License NPF-8 was issued authorizing Southern Nuclear Operating Company, Inc., (Southern Nuclear) to become the licensed operator. This change was implemented on December 23, 1991.

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 84 , are hereby incorporated in the license. Southern Nuclear shall operate the facility in accordance with the Technical Specifications.

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

FOR THE NUCLEAR REGULATORY COMMISSION

Elinor G. Adensam

Elinor G. Adensam, 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: December 30, 1991

ATTACHMENT TO LICENSE AMENDMENT NO. 84

TO FACILITY OPERATING LICENSE NO. NPF-8

DOCKET NO. 50-364

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
5-6	5-6
5-7	5-7

5.3 REACTOR CORE

FUEL ASSEMBLIES

5.3.1 The reactor core shall contain 157 fuel assemblies with each fuel assembly containing 264 fuel rods clad with Zircaloy-4. Each fuel rod shall have a nominal active fuel length of 144 inches. The initial core loading shall have a maximum nominal enrichment of 3.15 weight percent U-235. Reload fuel shall be similar in physical design to the initial core loading and shall have a maximum nominal enrichment of 4.25 weight percent U-235 for Westinghouse LOPAR fuel and a maximum nominal enrichment of 5.0 weight percent U-235 for Westinghouse OFA and VANTAGE-5 fuel. Westinghouse OFA and VANTAGE-5 fuel with maximum nominal enrichments greater than 3.9 weight percent U-235 shall contain sufficient integral burnable absorbers such that the requirements of specifications 5.6.1.1.c and 5.6.1.2.c are met. Westinghouse LOPAR fuel does not require integral burnable absorbers.

CONTROL ROD ASSEMBLIES

5.3.2 The reactor core shall contain 48 full length and no part length control rod assemblies. The full length control rod assemblies shall contain a nominal 142 inches of absorber material. The nominal values of absorber material shall be 80 percent silver, 15 percent indium and 5 percent cadmium. All control rods shall be clad with stainless steel tubing.

5.4 REACTOR COOLANT SYSTEM

DESIGN PRESSURE AND TEMPERATURE

5.4.1 The reactor coolant system is designed and shall be maintained:

a. In accordance with the code requirements specified in Section 5.2 of the FSAR, with allowance for normal degradation pursuant to the applicable Surveillance Requirements,

b. For a pressure of 2485 psig, and

c. For a temperature of 650°F, except for the pressurizer which is 680°F.

VOLUME

5.4.2 The total water and steam volume of the reactor coolant system is 9723 ± 100 cubic feet at a nominal T_{avg} of 525°F.

5.5 METEOROLOGICAL TOWER LOCATION

5.5.1 The meteorological tower shall be located as shown on Figure 5.1-1.

5.6 FUEL STORAGE

CRITICALITY

5.6.1.1 The spent fuel storage racks are designed and shall be maintained with a K_{eff} less than or equal to 0.95 when flooded with unborated water, which includes conservative allowances for uncertainties and biases. This is assured by maintaining:

a. A nominal 10.75 inch center-to-center distance between fuel assemblies placed in the storage racks.

b. A maximum nominal enrichment of 4.25 weight percent U-235 for Westinghouse LOPAR fuel assemblies.

c. A maximum reference fuel assembly K_∞ less than or equal to 1.455 at 68°F for Westinghouse OFA and VANTAGE-5 fuel assemblies.

5.6.1.2 The new fuel pit storage racks are designed and shall be maintained with a K_{eff} less than or equal to 0.98, assuming aqueous foam moderation. This is assured by maintaining:

a. A nominal 21 inch center-to-center distance between new fuel assemblies placed in the storage racks.

b. A maximum nominal enrichment of 4.25 weight percent U-235 for Westinghouse LOPAR fuel assemblies.

c. A maximum reference fuel assembly K_∞ less than or equal to 1.455 at 68°F for Westinghouse OFA and VANTAGE-5 fuel assemblies.

DRAINAGE

5.6.2 The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 149.

CAPACITY

5.6.3 The spent fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than 1407 fuel assemblies.

5.7 COMPONENT CYCLIC OR TRANSIENT LIMIT

5.7.1 The components identified in Table 5.7-1 are designed and shall be maintained within the cyclic or transient limits of Table 5.7-1.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 91 TO FACILITY OPERATING LICENSE NO. NPF-2

AND AMENDMENT NO. 84 TO FACILITY OPERATING LICENSE NO. NPF-8

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

JOSEPH M. FARLEY NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NOS. 50-348 AND 50-364

1.0 INTRODUCTION

By letter dated July 1, 1991, as supplemented October 18, 1991, Alabama Power Company (the licensee)* submitted a request for changes to the Joseph M. Farley Nuclear Plant, Units 1 and 2 (Farley), Technical Specifications (TS). The proposed amendment request was noticed in the Federal Register on August 21, 1991 (56 FR 41575).

The requested changes would update Farley TS 5.3 (Reactor Core) and TS 5.6 (Fuel Storage) to increase enrichments to a nominal 5.0 weight percent (w/o) U-235 for optimized fuel assemblies (OFA) and for VANTAGE-5 fuel assemblies taking credit for the presence of integral fuel burnable absorbers (IFBA). These proposed TS amendments allow for storage of 5.0 w/o enrichment U-235 OFA and VANTAGE-5 fuel in spent fuel and new fuel pit storage racks. The current licensing basis of 4.25 w/o maximum nominal enrichment for low parasitic (LOPAR) fuel remains unchanged. A request for TS amendments to allow for use of VANTAGE-5 fuel in reactor operation has been received from the licensee by letter dated July 15, 1991, and will be addressed separately.

Approval of these amendments was sought to accommodate onsite receipt of the VANTAGE-5 fuel as reload fuel several weeks prior to use in reactor operations. Approval of the future VANTAGE-5 fuel amendment requests will be required to allow for loading of fuel into the core and for operation of the reactor with the VANTAGE-5 fuel.

The October 18, 1991, letter revised the original submittal dated July 1, 1991, to address the environmental effects of extended burnup and higher initial enrichments, to clarify the increased enrichment requested, and to provide a revised evaluation of No Significant Hazards Consideration. As a result of the October 18, 1991, submittal, the requested amendments were renoticed in the Federal Register on November 13, 1991 (56 FR 57688).

* Subsequent to these submittals, Amendment Nos. 90 and 83 to Facility Operating Licenses NPF-2 and 8, respectively, were issued authorizing Southern Nuclear Operating Company, Inc., to become the licensed operator. This change was implemented on December 23, 1991.

2.0 EVALUATION

The Nuclear Regulatory Commission (NRC) staff's review of the proposed amendments included the following areas: radiological assessment of design basis accidents (DBA) which have already been analyzed for Farley and criticality aspects of the storage of VANTAGE-5 and OFA fuel in the Farley spent fuel and new fuel racks.

RADIOLOGICAL ASSESSMENT OF DESIGN BASIS ACCIDENTS

The staff and the licensee evaluated the potential impact of this change on the radiological assessment of design basis accidents (DBA) which have previously been analyzed for both of the Farley units. The licensee, in its October 18, 1991, submittal, determined that the proposed license amendment is bounded by the NRC's generic Environmental Assessments for extended burnup fuel use in commercial light water reactors and for effects of transportation resulting from extended fuel enrichment and irradiation provided in the Federal Register (53 FR 6054 on February 28, 1988, and 53 FR 30355 on August 11, 1988, respectively). The licensee concluded that there are no significant radiological or non-radiological environmental impacts associated with the proposed amendments.

In the October 18, 1991, submittal, the licensee noted that extended final burnups to 60,000 MTU megawatt days/metric ton Uranium (MWD/MTU) and initial nominal enrichments to 5 weight percent U-235 were anticipated. Alabama Power Company also noted that the NRC had noted in 53 FR 6054 that the environmental impacts summarized in Tables S-3 and S-4 in 10 CFR Part 51 bound the corresponding impacts for burnup levels up to 60,000 MWD/MTU and enrichments up to 5 weight percent.

The staff has reviewed the licensee's submittals, as well as a report prepared for the NRC, entitled "Assessment of the Use of Extended Burnup Fuel in Light Water Power Reactors," NUREG/CR 5009 dated February 1988. In this report, prepared by Pacific Northwest Laboratory (PNL), the changes that could result in the NRC DBA assumptions were examined to determine which assumptions contained in various Standard Review Plan (SRP) sections and/or Regulatory Guides might be changed as a result of extended burnup fuel up to 60,000 MWD/MTU.

The staff agrees with the report's conclusion that the only DBA which could be affected by the use of extended burnup fuel would be the potential thyroid doses that could result from a fuel handling accident. The PNL report estimates that the calculated iodine gap-release fraction is 20% greater for some high-power fuel designs than the Regulatory Guide 1.25 assumed value of 0.10. Thus, the calculated thyroid doses resulting from a fuel handling accident with extended burnup fuel could be 20% higher than those estimated using Regulatory Guide 1.25.

The staff has reevaluated the fuel handling accidents analyzed for the Farley units. For the case of the fuel handling accident in the fuel handling area, calculated two-hour exclusion area thyroid doses would increase from 9 to about 10.8 rem, and for the case of a fuel handling accident inside containment, calculated thyroid doses would increase from 45 rem to 54 rem.

Similarly, low population zone (LPZ) thyroid doses would be expected to increase from 1 to 1.2 rem for the fuel handling accident in the fuel handling area and from 7 to 8.4 rem for the fuel handling accident inside containment.

The staff concludes that the only potential increased doses resulting from DBA with continued extended burnup levels of up to 60,000 MWD/MTU meet acceptance criteria provided in SRP Section 15.7.4, (75 rem) and remain well within the dose guidelines set forth in 10 CFR Part 100.

CRITICALITY ASPECTS OF STORAGE

The Farley new fuel racks and spent fuel racks were previously analyzed for the storage of Westinghouse 17x17 LOPAR fuel assemblies with enrichments up to 4.3 w/o U-235, which includes a 0.05 w/o manufacturing uncertainty. The current analysis considers the storage of Westinghouse OFA and VANTAGE-5 fuel containing integral fuel burnable absorbers (IFBAs) with enrichments up to 5.05 w/o U-235, which also includes a 0.05 w/o manufacturing uncertainty. The fuel assembly IFBAs consist of a thin boron coating on the outside of the fuel pellet, thus making it an integral part of the fuel assembly.

The reactivity calculations were performed using the KENO IV code, a three-dimensional Monte Carlo theory program. In addition, the PHOENIX depletable, two-dimensional, transport theory code was used for burnup dependent and reactivity sensitivity calculations. The analytical methods and models used in the reactivity analysis have been benchmarked against experimental data for fuel assemblies similar to those for which the Farley racks are designed and have been found to adequately reproduce the critical values. This experimental data is sufficiently diverse to establish that the method bias and uncertainty will apply to rack conditions which include strong neutron absorbers, large water gaps, and low moderator densities. The staff finds these methods and models to be acceptable.

The design basis for preventing criticality outside the reactor is that, including uncertainties, there is a 95 percent probability at a 95 percent confidence level (95/95 probability/confidence) that the effective multiplication factor (k-eff) of the fuel assembly array will be no greater than 0.95. This k-eff limit applies to both the new (fresh) and spent fuel racks under all conditions, except for the new fuel rack under low water density (optimum moderation) conditions, where the k-eff limit is 0.98. Two analytical techniques are used to ensure the criticality criterion for the storage of IFBA fuel in the Farley storage racks. The first method uses reactivity equivalencing to establish the poison material loading required to meet the criticality limits. The second method uses the fuel assembly infinite multiplication factor (k-inf) to establish a reference reactivity.

The concept of reactivity equivalencing is predicated upon the reactivity decrease associated with the addition of IFBA fuel rods. A series of reactivity calculations are performed to generate a set of IFBA rod number versus enrichment ordered pairs which all yield the same k-eff when the fuel is stored in the spent fuel racks. This is shown in the attached figure (from the Westinghouse report, "Criticality Analysis of the Farley Units 1 & 2 Fresh and Spent Fuel Racks" of March 1991, provided by the licensee in its request of July 1, 1991) which shows that the rack reactivity of fuel with 80 IFBA rods

with an initial enrichment of 5.0 w/o U-235 is equivalent to the rack reactivity of fresh (unirradiated) fuel having an initial U-235 enrichment of 3.9 w/o U-235 and containing no IFBA rods. This equivalence relationship assures the maximum k-eff will be calculated since depletion calculations performed by the licensee have shown that the maximum reactivity of the Westinghouse fuel assemblies occurs at zero burnup for any number of IFBA rods per assembly. This method of reactivity equivalencing has been used by other licensees for fuel storage analyses and has been accepted by the staff.

The resulting k-eff for the Farley spent fuel storage racks was less than 0.95 and included all appropriate biases and uncertainties at a 95/95 probability/ confidence level. This meets the NRC acceptance criterion and is, therefore, acceptable.

In order to simplify verification of acceptability for storage of fuel in the spent fuel racks, a k-infinity for a fresh 3.9 w/o U-235 fuel assembly was determined. As mentioned earlier, this is equivalent to the reactivity of a 5.0 w/o U-235 fuel assembly with 80 IFBA rods. When k-infinity is used as a reference reactivity point, the need to specify an acceptable enrichment versus number of IFBA rods correlation is eliminated. Calculation of k-infinity for a fuel array of 5.0 w/o fuel in the Farley reactor core geometry resulted in a reference value of 1.455. The licensee has shown that fuel with a reference k-infinity of 1.455 results in a maximum k-eff of less than 0.95 when stored in the Farley spent fuel storage racks. Therefore, the only requirement needed to ensure that the fuel racks are maintained at a k-eff below 0.95 is to verify that for each assembly, the k-infinity is no greater than 1.455 at 68°F in the core geometry.

For the new fuel racks, the criticality analyses showed that the rack k-eff is 0.8190 for the low water density (optimum moderation) condition for the storage of Westinghouse 17x17 standard (STD) fuel assemblies with enrichments up to 4.80 w/o and no credit for any burnable absorber in the fuel rods. Previous Westinghouse studies have shown the 17x17 STD fuel assembly to be more reactive than the other 17x17 fuel assembly types under optimum moderation conditions. Based on this, the staff concludes that the NRC criticality criterion of k-eff no greater than 0.98 under optimum moderation conditions would be met for 5.0 w/o fuel, even with no credit for burnable absorbers. For the fully flooded new fuel racks, 4.80 w/o fuel resulted in a k-eff of 0.9346 with no credit for burnable absorbers. This limit can be increased to U-235 enrichments of 5.0 w/o for OFA and VANTAGE-5 fuel in the new fuel racks by taking credit for the same IFBA versus enrichment relationship used in the spent fuel rack analysis. Since fuel assemblies in the spent fuel rack are limited to the equivalent reactivity of an OFA or VANTAGE-5 3.90 w/o assembly, compared to 4.80 w/o in the new fuel racks, the spent fuel rack limit is the more restrictive of the two and it is conservative to use the spent fuel rack enrichment IFBA limit for the new fuel storage rack under full moderation conditions. Although both NRC criteria are met for the new fuel storage racks, current Farley TS for the new fuel pit storage racks do not include the 0.95 limit.

It is possible to postulate events that could lead to an increase in storage rack reactivity, such as misloading an assembly with an enrichment and IFBA combination outside of the acceptable limits or dropping an assembly into an already loaded cell. However, the requirements of the spent fuel rack IFBA

limit for OFA and VANTAGE-5 fuel will become a design constraint on future Farley reload core designs and fuel vendor quality assurance controls will provide adequate assurances that a potentially violating fuel assembly will not be delivered to the site. For the postuluted accident of dropping a fuel assembly into an already loaded cell, the overall reactivity effect would be insignificant, and the k-eff limit of 0.95 would not be violated. The new fuel racks are maintained in a dry environment under normal conditions. Therefore, the introduction of full density and low density (optimum moderation) water are the bounding reactivity events. For both cases, k-eff remains below the acceptance limits of 0.95 and 0.98, respectively.

Based on the evaluation of criticality aspects of storage, the staff concludes that the Farley, Units 1 and 2, new and spent fuel storage racks can accommodate Westinghouse OFA and VANTAGE-5 fuel assemblies with maximum nominal enrichments of 5.0 w/o U-235 provided that the fuel assemblies with enrichment greater than 3.90 w/o U-235 contain sufficient IFBAs such that the maximum core geometry k-infinity of these assemblies is no greater than 1.455 at 68°F. Farley TS 5.3.1 has been modified to incorporate this requirement.

Although the Farley TS have been modified to specify acceptable reload fuel as that having a maximum reference fuel assembly k-infinity less than or equal to 1.455 in the core geometry at 68°F with no soluble boron, evaluations of reload core designs (using any enrichment) will, of course, be performed on a cycle-by-cycle basis as part of the reload safety evaluation process. Each reload design is evaluated to confirm that the cycle core design adheres to the limits that exist in the accident analyses and TS to ensure that reactor operation is acceptable.

3.0 STATE CONSULTATION

In accordance with the Commission's regulations, the State of Alabama official was notified of the proposed issuance of the amendment. The State official had no comments.

4.0 ENVIRONMENTAL CONSIDERATION

Pursuant to 10 CFR 51.21, 51.32, and 51.35, an Environmental Assessment and Finding of No Significant Impact has been prepared and published in the Federal Register on December 30, 1991 (56 FR 67337). Accordingly, based upon the Environmental Assessment, the Commission has determined that the issuance of this amendment will not have a significant effect on the quality of the human environment.

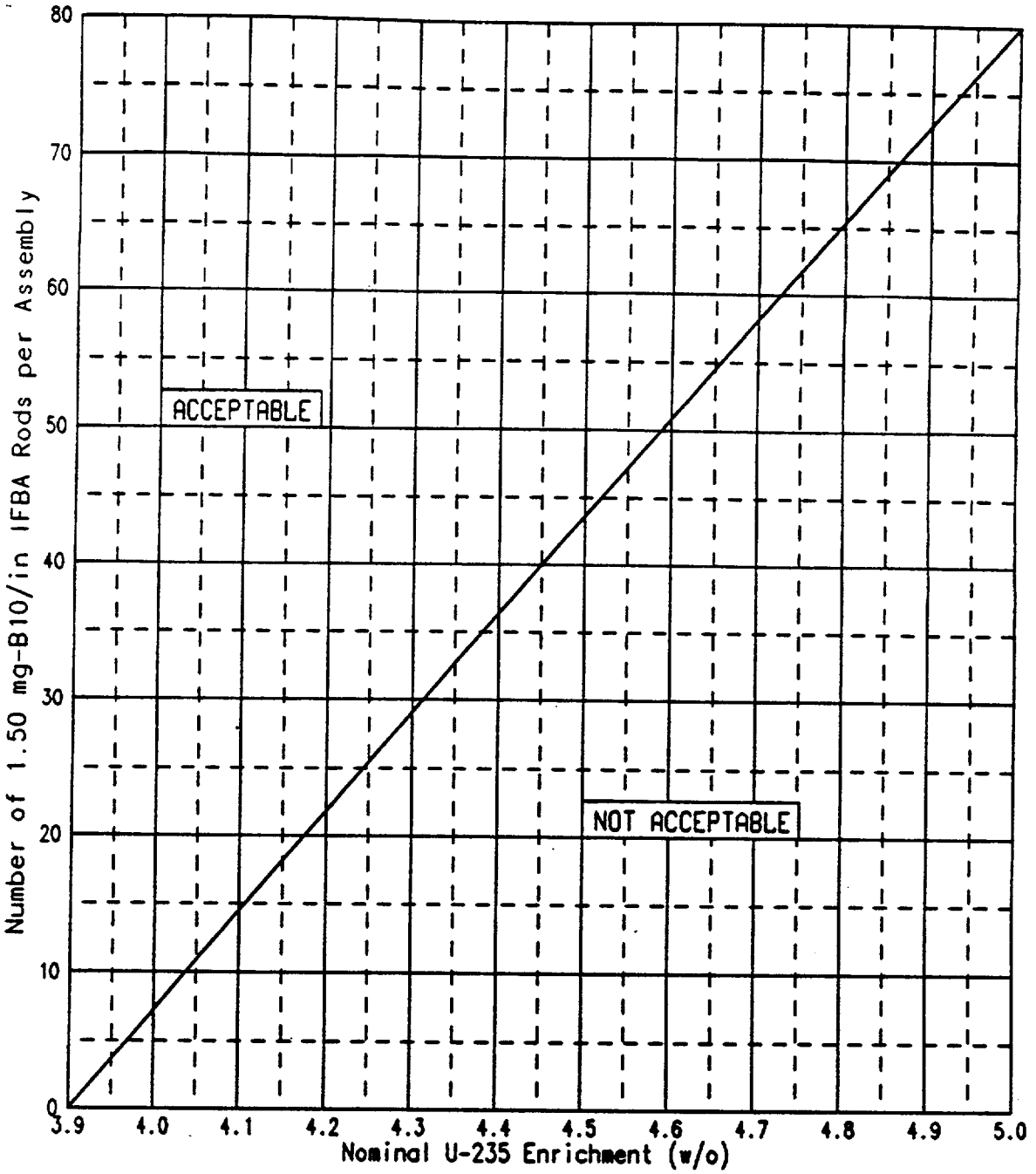
5.0 CONCLUSION

The Commission 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, (2) such

activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: S. Hoffman
K. Eccelston
L. Kopp

Date: December 30, 1991



Note: The IFBA rod requirements shown in this figure are based on an IFBA linear B10 loading of 1.50 mg-B10/in. For higher IFBA linear B10 loadings, the required number of IFBA rods per assembly can be reduced by the ratio of the increased B10 loading to the nominal 1.50 mg-B10/in loading.

Farley Units 1 & 2 Spent Fuel Storage Minimum IFBA Requirements