FPL Energy
Seabrook Station

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MAR 28 2005

Docket No. 50-443
SBK-L-05062

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

Seabrook Station
License Amendment Request 04-05
"Changes to Spent Fuel Assembly Storage Technical Specifications"

FPL Energy Seabrook, LLC (FPL Energy Seabrook) has enclosed herein License Amendment Request (LAR) 04-05. License Amendment Request 04-05 is submitted pursuant to the requirements of 10 CFR 50.90 and 10 CFR 50.4.

LAR 04-05 proposes changes to Seabrook Station Technical Specification (TS) 3/4.9.13, Spent Fuel Assembly Storage and associated TS Figures, Index and Bases; and TS 3/4.9.14, New Fuel Assembly Storage. The proposed changes reflect a revised criticality safety analysis supporting a two-zone spent fuel pool, consisting of BORAFLEX® and BORAL® fuel assembly storage racks. In addition, this proposed change adds a new Technical Specification, TS 3/4.9.15, Spent Fuel Pool Boron Concentration, and accompanying bases as a result of the criticality analysis that supports a two-zone spent fuel pool.

As discussed in the enclosed LAR Section IV, the proposed change does not involve a significant hazard consideration pursuant to 10 CFR 50.92. A copy of this letter and the enclosed LAR has been forwarded to the New Hampshire State Liaison Officer pursuant to 10 CFR 50.91(b). FPL Energy Seabrook has determined that LAR 04-05 meets the criteria of 10 CFR 51.22(c)(9) for a categorical exclusion from the requirements for an Environmental Impact Statement. The Station Operation Review Committee and the Company Nuclear Review Board have reviewed this LAR.

FPL Energy Seabrook requests NRC Staff review of LAR 04-05, and issuance of a license amendment by March 31, 2006, with implementation of the amendment within 90 days.

A001

Should you have any questions regarding this letter, please contact Mr. James M. Peschel, Regulatory Programs Manager, at (603) 773-7194.

Very truly yours,

FPL Energy Seabrook, LLC.

Mark E. Warner
Site Vice President

cc: S. J. Collins, NRC Region I Administrator
V. Nerses, NRC Project Manager, Project Directorate I-2
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FPL Energy
Seabrook Station

SEABROOK STATION UNIT 1

Facility Operating License NPF-86
Docket No. 50-443

License Amendment Request 04-05,
"Changes to Spent Fuel Assembly Storage Technical Specifications"

The following information is enclosed in support of this License Amendment Request:

- **Section I - Introduction and Safety Assessment for Proposed Change**
- **Section II - Markup of Proposed Change**
- **Section III - Retype of Proposed Change**
- **Section IV - Determination of Significant Hazards for Proposed Change**
- **Section V - Proposed Schedule for License Amendment Issuance And Effectiveness**
- **Section VI - Environmental Impact Assessment**

I, Mark E. Warner, Site Vice President of FPL Energy Seabrook, LLC hereby affirm that the information and statements contained within this License Amendment Request are based on facts and circumstances which are true and accurate to the best of my knowledge and belief.

Sworn and Subscribed
before me this
28 **day of** March, **2005**

MICHAEL D. O'KEEFE
MY COMMISSION EXPIRES FEB. 5, 2008
NOTARY PUBLIC
NEW HAMPSHIRE

Notary Public

Mark E. Warner
Site Vice President

Section I

Introduction and Safety Assessment for Proposed Change

I. INTRODUCTION AND SAFETY ASSESSMENT FOR PROPOSED CHANGE

A. Introduction

LAR 04-05 proposes changes to Seabrook Station Technical Specification (TS) 3/4.9.13, Spent Fuel Assembly Storage and associated TS Figures, Index and Bases; and TS 3/4.9.14, New Fuel Assembly Storage. The proposed changes reflect a revised criticality safety analysis supporting a two-zone spent fuel pool, consisting of BORAFLEX® and BORAL® fuel assembly storage racks. In addition, this proposed change adds a new Technical Specification, TS 3/4.9.15, Spent Fuel Pool Boron Concentration, and accompanying bases as a result of the criticality analysis that supports a two-zone spent fuel pool.

B. Safety Assessment of Proposed Change

<u>Description of Proposed Changes</u>

This change incorporates into TS 3/4.9.13, Spent Fuel Assembly Storage, the results of a revised criticality analysis for the spent fuel pool. Existing TS Figure 3.9-1, Fuel Assembly Burnup vs. Initial Enrichment for Spent Fuel Assembly Storage, has been modified and will control the storage of spent fuel in the BORAL® storage racks. New figure 3.9-2 has been added to control the placement of spent fuel in the BORAFLEX® storage racks.

The current TS do not control the spent fuel boron concentration. The previous accident analyses assumed credit for boron in the spent fuel pool for abnormal configurations, and this was allowed based on plant procedures that require a weekly verification of spent fuel pool boron concentration. The revised safety analyses determined that a minimum spent fuel pool boron concentration of 872 ppm is required to maintain a K_{eff} of less than or equal to 0.95. As a result, this change also adds new TS 3/4.9.15, Spent Fuel Pool Boron Concentration, which specifies a minimum boron concentration that is required during movement of fuel in the spent fuel pool.

This LAR also revises the surveillance requirements of TS 4.9.13.2 and 4.9.14.1. These surveillance requirements confirm that the fuel assemblies are properly stored following movement of fuel in the spent fuel pool or movement of new fuel into or out of the new fuel storage vault. Consistent with the wording used in the Improved Standard Technical Specifications (NUREG 1431, revision 3), the surveillance requirements are modified to verify the proper storage of new and spent fuel by the use of administrative means.

This change updates and makes minor corrections to the existing TS bases; and adds a bases for new TS 3/4.9.15, Spent Fuel Pool Boron Concentration. The Seabrook Station Updated Final Safety Analyses Report (UFSAR) will be updated to incorporate the results of the revised criticality analysis.

Background

The Spent Fuel Pool at Seabrook Station was designed and licensed (Ref. TS 5.6.3) for a storage capacity of 1236 fuel assemblies as discussed in section 9.1.2 of the Seabrook Station UFSAR. However, at the time Seabrook Station began commercial operation, only a portion of the storage racks were installed in the pool, providing a storage capacity for 660 fuel assemblies. In the mid-1990s, the former licensee, North Atlantic Energy Service Corporation (North Atlantic) investigated options for adding an additional 576 storage cells to achieve the full capacity of 1236. At the same time, the issues with fuel assembly storage racks containing BORAFLEX® neutron absorber material were well known. BORAFLEX® is the material used in the storage racks initially installed at Seabrook Station. Because of the gamma radiation-induced degradation problems associated with BORAFLEX® (i.e., thinning and dimensional shrinkage), North Atlantic completed the spent fuel pool rack installation with storage racks containing BORAL® neutron absorber material, which does not exhibit the problems associated with BORAFLEX®.

Revised Criticality Analysis

A revised criticality safety analysis[1] for the spent fuel pool, applicable to the robust fuel assembly design (RFA) now used at Seabrook Station, was performed for two loading configurations. The first loading configuration included the BORAL® storage racks, and the second loading configuration considered a two-zone spent fuel pool with both rack designs, BORAL® and BORAFLEX®.

The evaluation of the first loading configuration confirmed that the current Technical Specification requirements would adequately control placement of spent fuel within the BORAL® storage racks. The analysis of the second loading configuration considered a spent fuel pool arrangement containing a two-zone storage rack design having a designated BORAL® Zone and a designated BORAFLEX® Zone. The analysis assumed criticality control for the BORAL® Zone is achieved by the flux trap principle. Due to the issues associated with BORAFLEX® degradation, the analysis of the BORAFLEX® Zone assumed no neutron absorbing material (B^{10}) in the BORAFLEX®. Consequently, criticality control for the BORAFLEX® Zone is maintained by the combination of fuel enrichment and burnup.

Methodology

The criticality analysis was performed in accordance with "Guidance on the Regulatory Requirements for Criticality Analysis of Fuel Storage at Light-Water Reactor Power Plants" (Laurence I. Kopp. U.S. Nuclear Regulatory Commission, February 1998). The Seabrook criticality analysis used the fuel rod and fuel assembly parameters provided in Table 1, Nominal Fuel Assembly Design Specifications. The unit cell used for the criticality analysis is provided in Figure 1, Storage Rack Unit Cell for Criticality Analysis. This figure identifies the empty lattice

[1] "Criticality Analysis of Seabrook Station's New and Spent Fuel Boral and Boraflex Storage Racks," DES-NFQA-98-02, September 1998. Duke Engineering & Services (DE&S).

locations (guide tubes). Two eccentric assembly placements were evaluated: fuel residing in the corner and fuel centered on an inside edge. These two cases were run with mirror and periodic boundary conditions. The results are presented in Table 2, BORAL® Storage Rack Eccentric Fuel Analysis, and show that fuel positioned in the center of a storage cell (the base case) is the most limiting.

The criticality safety methods[2] used for Seabrook Station were developed and validated based on KENO-V.a Monte Carlo, CASMO-3 LWR lattice integral transport, and SIMULATE-3 nodal burnup credit analysis. This permits criticality analysis by several independent methods and allows the flexibility to accommodate various light water reactor (LWR) fuel types, fuel storage arrays and criticality safety assumptions. The criticality safety methodology calculates rack K_{eff} vs. fresh fuel enrichment, unit cell geometry sensitivity to mechanical tolerances, and rack K_{eff} vs. burnup with CASMO-3. KENO-V.a is used to verify the nominal K_{eff} values calculated by CASMO-3 and, where necessary, provides a bias to the CASMO-3 calculations.

The KENO-V.a calculations utilize the SCALE 4.3 CSAS25 criticality sequence methodology, which includes the Material Information Processor, BONAMI, NITAWL-II and KENO-V.a. The Material Information Processor generates number densities for each material, generates resonance self-shielding geometry data and creates data input files for the cross section processing codes BONAMI and NITAWL-II. BONAMI and NITAWL-II generate a resonance corrected cross section library in AMPEX working format for input into KENO-V.a. The ENDF/B-V 44-group neutron library was used in all the SCALE 4.3 CSAS25 calculations.

The SCALE 4.3 CSAS25 criticality sequence was benchmarked against the 21 B&W critical experiments described in B&W-1484-7, "Critical Experiments Supporting Close Proximity Water Storage of Power Reactor Fuel," N. M. Baldwin, G. S. Hoovler, R. L. Eng and F. G. Welfare, July 1979. The benchmarking of KENO-V.a was required to determine the calculated bias for use in the 95% probability, 95% confidence K_{eff} calculation. The results of the benchmarking are provided in Table 3, Equation for K_{eff} Calculation at the 95/95 Probability/Confidence Level, and Table 4, KENO-V.a Keff Results and Uncertainty Calculation.

To determine the maximum fresh fuel enrichment in both the BORAL® and BORAFLEX® Zones, CASMO-3 calculations utilize fresh fuel and vary the initial enrichment until the K_{eff} is less than the acceptance criterion of 0.95. The maximum fresh fuel enrichment to yield a k_{eff} of 0.95 with uncertainty was determined from 2D KENO-V.a infinite array models of the BORAL® and BORAFLEX® regions of the pool. For the BORAL® racks, the maximum fresh fuel enrichment is 3.66 w/o and for the BORAFLEX® racks, the maximum fresh fuel enrichment is 1.58 w/o. Due to the issues associated with BORAFLEX® degradation, the analysis of the BORAFLEX® racks assumed no neutron absorbing material (B10) in the BORAFLEX®. To perform the Seabrook accident analysis, a 2D KENO-V.a model was generated for the complete

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[2] The Seabrook Station criticality safety analysis was reviewed for NRC Regulatory Issue Summary 2001-12, "Non-Conservatism in Pressurized Water Reactor Spent Fuel Storage Pool Reactivity Equilvalencing Calculations." The criticality safety analysis performed for Seabrook Station did not utilize reactivity equivalencing as all assembly configurations are explicitly represented. Therefore, this issue does not affect the Seabrook Station spent fuel pool criticality analysis.

fuel pool loaded with fresh fuel at the maximum allowable enrichment without burnup credit. The 2D KENO-V.a model of the completely filled spent fuel pool yielded a k_{eff} of 0.92686 without uncertainties which is consistent with the infinite array KENO-V.a models of the BORAL® and BORAFLEX® regions. Thus, in the complete pool model, the interface between the BORAL® and BORAFLEX® regions is treated explicitly.

To go beyond the maximum fresh fuel enrichment, credit for burnup was used in both the BORAL® and BORAFLEX® rack designs. The results of this analysis established the acceptable enrichment and burnup combinations for the BORAL®and BORAFLEX® Zones. To determine the enrichment/burnup combinations, a maximum reactivity acceptance criterion, including uncertainties, was established. Enrichment/burnup calculations were performed with CASMO-3 in the rack geometry utilizing the actual spent fuel isotopic inventory until the acceptance criterion was met. Since the burnup credit analysis was performed in two dimensions, a 2D to 3D penalty was determined. This penalty accounts for the effects of axial burnup and moderator history. Since axial leakage has a negative effect on reactivity, 2D analysis is usually conservative. However, both the axial assembly burnup and the moderator density history effects have a complicated nonlinear effect on the reactivity in a storage array. The Seabrook analysis used the 3D code, SIMULATE-3, to determine the effects of both axial assembly burnup and moderator history relative to the 2D analysis. The calculations were performed using 5.0 w/o fuel at 68 °F in the rack geometry. The 2D analysis used assembly average exposure and the 3D analysis included the axial burnup effects and the moderator characteristics of burned fuel. The calculations for the Seabrook spent fuel racks showed a nearly linear 2D to 3D reactivity penalty as a function of burnup. For example, at 5.0 w/o and 40 GWD/MTU, the Seabrook penalty is 0.024 ΔK.

To accommodate the high enrichment in the BORAL® Zone, two types of checkerboard analyses were performed. The fresh fuel checkerboard analysis determined the criticality of fuel at various enrichments placed next to fresh fuel with an enrichment of 5.0 w/o. The fresh and burned fuel checkerboard analysis used fresh fuel at an enrichment of 5.0 w/o while the burned fuel was varied in initial enrichment from 3.5 w/o to 5.0 w/o and assembly burnup was varied from 0 to 50 GWD/MTU. These calculations were performed with SIMULATE-3 with cross section input from CASMO-3.

BORAL® Blisters

In 2003, an examination of the BORAL® test coupons in the spent fuel pool identified blisters on the coupons. These blisters are assumed to create an air gap in the BORAL® that will reduce the effect of the water gap flux trap, resulting in an increase in the reactivity in the racks. As a result, the effect of the BORAL® blisters was addressed with a conservative blister penalty imposed on the criticality and accident analyses[3]. Although it is expected that the BORAL® blisters will refill with water, resulting in no change to the analysis, the blister penalty was determined using the following very conservative assumptions:

[3] "SBC-1005: Evaluation of SB Spent Fuel Pool Criticality with Boral Blistering" 32-5026526-04, September 2003, Framatome-ANP.

- The blisters will not refill with water but will create a void. This approach essentially reduces the center-to-center spacing.

- The blisters are over the entire length and width of the BORAL®.

Using these assumptions, CASMO-3 calculations were performed to determine a BORAL® blister penalty. The CASMO-3 analyses were validated with KENO-V.a calculations. The analysis was performed both as a function of blister thickness and burnup and as a function of enrichment. The analysis as a function of blister thickness and burnup was performed using an assembly enriched to 4.5 w/o and is provided in Table 5, Blister Penalty as a Function of Blister Thickness at 4.5 w/o. The analysis as a function of enrichment is provided in Table 6, Blister Penalty as a Function of Enrichment Fresh Fuel. Based on this analysis, the thickness of the blisters was assumed to be 45 mils on each side of the BORAL® for a total blister thickness of 90 mils, much higher than observed in the coupons. Therefore, a blister penalty of 0.01077 ΔK, representing 90 mil thick blisters for fresh fuel at 5.0 w/o, was applied to the existing analysis to determine the Technical Specification requirements.

With the blister penalty applied, the maximum enrichment in the BORAL® region is reduced from 3.66 w/o to 3.45 w/o. The 0.01077 ΔK penalty was also applied to the BORAL® checker-boarding analysis. To validate the use of a blister penalty on the accident analysis, the limiting accident was calculated with KENO-V.a using 90 mil thick blisters. The results showed that the application of a blister penalty is conservative.

The results of the above analyses were used to develop the proposed Technical Specification loading curves (i.e., proposed TS Figures 3.9-1 and 3.9-2 for the BORAL® and BORAFLEX® Zones, respectively).

Accident Analyses

Accident analyses were performed for both the BORAL® and BORAFLEX® spent fuel racks, fully loaded with fresh fuel at the maximum allowable enrichment for the rack type. The accidents analyzed considered a fresh 5.0 w/o U-235 enriched fuel assembly being misplaced within the BORAL® and BORAFLEX® storage racks and being placed outside the racks at various pool locations. Even though placing an assembly outside the rack may not be possible due to piping interference, this accident configuration was still analyzed. An assembly dropped on top of the racks is sufficiently separated from the active fuel and is bounded by other accident configurations. The spent fuel pool layout is presented in Figure 2, Seabrook Spent Fuel Pool Layout, and the results of the accident cases are summarized in Table 7, Accident Analysis Summary. The analysis identified the limiting case that resulted in the highest K_{eff} at zero ppm soluble boron. Then, the limiting case was analyzed as a function of boron in the spent fuel pool water with the results provided in Table 8, Limiting Accident Soluble Boron Analysis Summary Outside Module 10 in Inner Corner.

The placement of the fuel in the BORAL® region was determined by increasing the calculated K_{eff} by the margin for uncertainty in the calculation method and mechanical tolerances, a 2D to

3D penalty, and a blister penalty. Using this approach, the resulting value of K_{eff} is maintained less than or equal to 0.95 with a 95% probability at a 95% confidence level. Applying the blister penalty to the limiting accident is conservative and generates a boron requirement of 872 ppm to maintain a sub-criticality limit of 0.95 during fuel movement. As a result, the TS will include a new limiting condition for operation (LCO) that specifies a minimum boron concentration during movement of fuel in the spent fuel pool.

With respect to the new TS:

1. The LCO stipulates a minimum required spent fuel boron concentration of 900 ppm. This round value includes 872 ppm required by the spent fuel pool criticality analysis and 10 ppm for measurement uncertainty.

2. The LCO is applicable during the movement of fuel assemblies until verifying through administrative means that the assemblies are properly stored because this is the only time that a fuel assembly could be misplaced. The storage of fuel assemblies within the spent fuel pool is governed by TS 3/4.9.13, which requires verification that the fuel assemblies are stored properly. Therefore, no minimum boron concentration is required when fuel movement is not in progress and the assemblies are stored properly since the analysis for assemblies stored in the pool does not credit boron for accidents other than the misplaced assembly.

3. The ACTIONS are appropriate and similar to the required actions contained in the Improved Standard Technical Specifications (ISTS), NUREG-1431, revision 3.

4. The surveillance requirement provides for verification of the spent fuel pool boron concentration every 7 days, similar to the ISTS. The 7-day frequency is appropriate because no major replenishment of spent fuel pool water is expected to occur over such a short period of time.

The SFP criticality analysis also considered the configuration of the entire SFP loaded with 5 w/o enriched U-235 fuel. The analysis of this configuration showed acceptable results with Keff remaining well below the 0.95 limit with 2000-ppm boron in the SFP. The Seabrook SFP contains boron greater than 2000 ppm, and under the double contingency principle, taking credit for the presence of this boron to show acceptable results under abnormal conditions is appropriate.

This LAR also revises the wording associated with surveillance requirements of TS 4.9.13.2 and 4.9.14.1. These surveillance requirements confirm that the fuel assemblies are properly stored following movement of fuel in the spent fuel pool or movement of new fuel into or out of the new fuel storage vault. Consistent with the wording used in the Improved Standard Technical Specifications (NUREG 1431, revision 3), the surveillance requirements are modified to verify the proper storage of new and spent fuel by the use of administrative means.

TS 4.9.13.1, which is unchanged by this LAR, requires a determination of the burnup of each fuel assembly to be stored in the spent fuel pool from its burnup history prior to storage in the spent fuel pool. Station procedures that implement this surveillance requirement include a provision for independent verification of the fuel burnup before the fuel is placed in its designated storage location.

The following regulations, guides and standards pertaining to criticality safety for spent fuel and new fuel storage were used in the analysis of the Seabrook Station spent fuel racks:

- 10 CFR 50, Appendix A, General Design Criterion 62, Prevention of Criticality in Fuel Storage and Handling
- NUREG-0800, USNRC Standard Review Plan, Section 9.1.2, Spent Fuel Storage; Section 9.1.1, New Fuel Storage
- ANSI/ANS-57.2 – 1983, Design Requirements for Spent Fuel Storage Facilities at Nuclear Power Plants, Section 6.4.2.
- ANSI/ANS-57.3 – 1983, Design Requirements for New Fuel Storage Facilities at LWR Plants, Section 6.2.4
- "Guidance on the Regulatory Requirements for Criticality Analysis of Fuel Storage at Light-Water Reactor Power Plants," Laurence I. Kopp. U.S. Nuclear Regulatory Commission, February 1998

These guides and standards state that for spent fuel racks the maximum calculated K_{eff}, including margin for uncertainty in calculation method and mechanical tolerances, be less than or equal to 0.95 with a 95% probability at a 95% confidence level. The criticality analysis of the high-density spent fuel racks demonstrates that this criterion is satisfied.

FPL Energy Seabrook concludes that the proposed changes do not adversely affect or endanger the health or safety of the general public or involve a significant safety hazard.

TABLES

TABLE 1

Nominal Fuel Assembly Design Specifications

Assembly Mechanical Design	
Assembly Pitch, in core	8.466 in
Rod Pitch	0.496 in
Number of Grids, in core	7
Grid Material	Inc718 & Zirc
Active Core Height	144.0 in
Fuel Rod Mechanical Design	
Outside Diameter	0.374 in
Diametral Gap	0.0065 in
Pellet Diameter	0.3225 in
Pellet Compositions	UO_2
Clad Thickness	0.0225 in
Clad Material	Zirc-4
Pellet Stack Density	10.412 g/cm
Guide Tube Mechanical Design	
Outside Diameter	0.484 in
Inside Diameter	0.448 in
Tube Material	Zirc-4

TABLE 2

BORAL® Storage Rack Eccentric Fuel Analysis

Case Description	Boundary Conditions	k_{eff}
Base	Mirror	0.98951 ± 0.00072
Fuel in Corner	Mirror	0.98715 ± 0.00073
Fuel in Corner	Reflective	0.98456 ± 0.00071
Fuel on Edge	Mirror	0.98785 ± 0.00071
Fuel on Edge	Reflective	0.98677 ± 0.00070

TABLE 3

Equation for K_{eff} Calculation at the 95/95 Probability/Confidence Level

The 21 B&W critical experiments described in B&W–1484-7 were modeled and run with the SCALE 4.3 CSAS25 criticality sequence. Table 4 shows the k_{eff} results and the calculation of the KENO V.a uncertainties using the SCALE 4.3 CSAS25 sequence and the 44 group ENDF/B-V library. The equations used to calculate the uncertainties are shown below. The 95/95 one-sided tolerance factor for the 21 cases is 2.371.

k_{eff} is calculated at the 95/95 probability/confidence level by the following equation:

$$K_{95/95} = K_{nom} + \Delta K_{cb} + \sqrt{(\Delta K_c)^2 + (2\sigma_k)^2 + (\Delta K_m)^2}$$

where:

K_{nom} = K_{eff} of the nominal configuration

ΔK_{cb} = calculation bias

ΔK_c = 95/95 calculation uncertainty

σ_k = KENO V.a uncertainty (deviation), and

ΔK_m = 95/95 mechanical uncertainty.

From Table 4 $\Delta K_{cb} = 0.00540$ and $\Delta K_c = 0.00796$

TABLE 4

KENO V.a k_{eff} Results and Uncertainty Calculation

Core	Measured k_{eff}	Calculated k_{eff}
1	1.0002 ± 0.0005	0.99561 ± 0.00063
2	1.0001 ± 0.0005	0.99675 ± 0.00051
3	1.0000 ± 0.0006	0.99994 ± 0.00053
4	0.9999 ± 0.0006	0.99308 ± 0.00062
5	1.0000 ± 0.0007	0.99329 ± 0.00062
6	1.0097 ± 0.0012	1.00257 ± 0.00063
7	0.9998 ± 0.0009	0.99339 ± 0.00061
8	1.0083 ± 0.0012	1.00206 ± 0.00062
9	1.0030 ± 0.0009	0.99836 ± 0.00059
10	1.0001 ± 0.0009	0.99660 ± 0.00057
11	1.0000 ± 0.0006	0.99955 ± 0.00056
12	1.0000 ± 0.0007	0.99583 ± 0.00059
13	1.0000 ± 0.0010	0.99714 ± 0.00061
14	1.0001 ± 0.0010	0.99437 ± 0.00062
15	0.9998 ± 0.0016	0.99030 ± 0.00057
16	1.0001 ± 0.0019	0.98980 ± 0.00061
17	1.0000 ± 0.0010	0.99426 ± 0.00057
18	1.0002 ± 0.0011	0.99231 ± 0.00060
19	1.0002 ± 0.0010	0.99492 ± 0.00054
20	1.0003 ± 0.0011	0.99562 ± 0.00057
21	0.9997 ± 0.0015	0.99228 ± 0.00059
$K \pm \sigma$	1.0006 ± 0.0010	0.99567 ± 0.00059
σ_m		0.00336
ΔK_{cb}		0.00540
$\Delta K_c = \sigma_m$ 95/95		0.00796

TABLE 5

Blister Penalty as a Function of Blister Thickness at 4.5 w/o

Blister Thickness (mils)	Penalty (ΔK)		
	0 GWd/MT	5 GWd/MT	10 GWd/MT
0	0	0	0
14	0.00160	0.00153	0.00148
20	0.00228	0.00236	0.00219
30	0.00344	0.00347	0.00327
40	0.00459	0.00458	0.00435
50	0.00577	0.00570	0.00544
60	0.00694	0.00685	0.00655
70	0.00814	0.00799	0.00766
80	0.00932	0.00914	0.00877
90	0.01053	0.01029	0.00988

TABLE 6

Blister Penalty as a Function of Enrichment
Fresh Fuel

Enrichment (w/o))	Penalty (ΔK)
1.6	0.00761
2.0	0.00822
2.5	0.00899
3.0	0.00952
3.5	0.00992
4.0	0.01024
4.5	0.01053
5.0	0.01077

TABLE 7

Accident Analysis Summary

Accident Description	k_{eff}
Outside Module 10 Near Module 2	1.02899 ± 0.00074
Outside Module 10 in Inner Corner	1.06067 ± 0.00072
Outside Modules 7/12 Corner	1.04732 ± 0.00078
Outside Module 12, Assemblies Lined Up	0.92686 ± 0.00054
Outside Module 12, Assemblies Not Lined Up	0.92686 ± 0.00054
In BORAFLEX® Module 4	1.00313 ± 0.00060
In BORAFLEX® Module 1 Near BORAL® Module 9	0.98241 ± 0.00063
In BORAL® Module 9 Near BORAFLEX® Module 1	0.92662 ± 0.00056
In BORAL® Module 12	0.92630 ± 0.00051

TABLE 8

Limiting Accident Soluble Boron Analysis Summary
Outside Module 10 in Inner Corner

Soluble Boron Concentration (ppm)	k_{eff}
400	0.98438 ± 0.00084
500	0.97034 ± 0.00070
600	0.94901 ± 0.00093
700	0.94317 ± 0.00067
750	0.93318 ± 0.00072
800	0.92851 ± 0.00067
Interpolated without blister penalty 810 ppm	0.92686 ± 0.00054
Interpolated with blister penalty 872 ppm	(0.92686-0.01077) ± 0.00054
900	0.91124 ± 0.00075
1000	0.90154 ± 0.00073
1100	0.88897 ± 0.00068
1200	0.87997 ± 0.00066
1300	0.86550 ± 0.00075
1400	0.85576 ± 0.00065

FIGURES

FIGURE 1

Storage Rack Unit Cell for Criticality Analysis

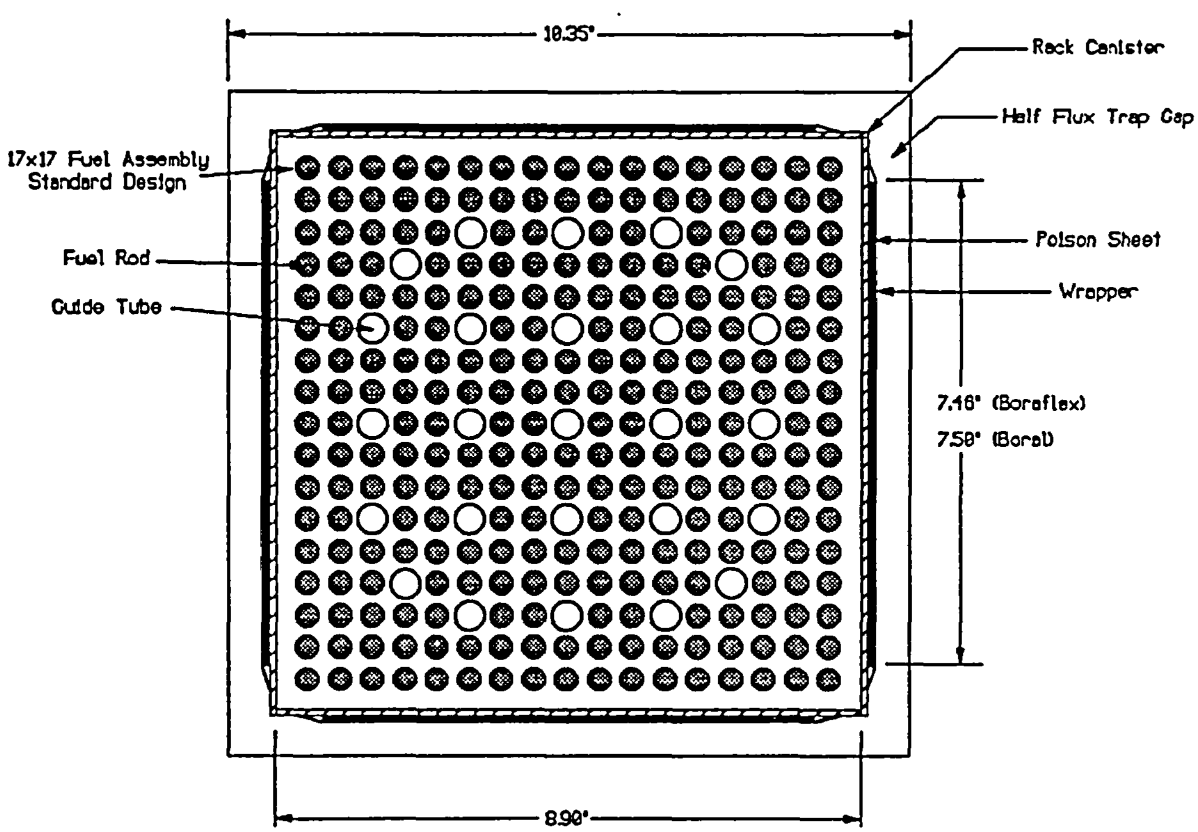
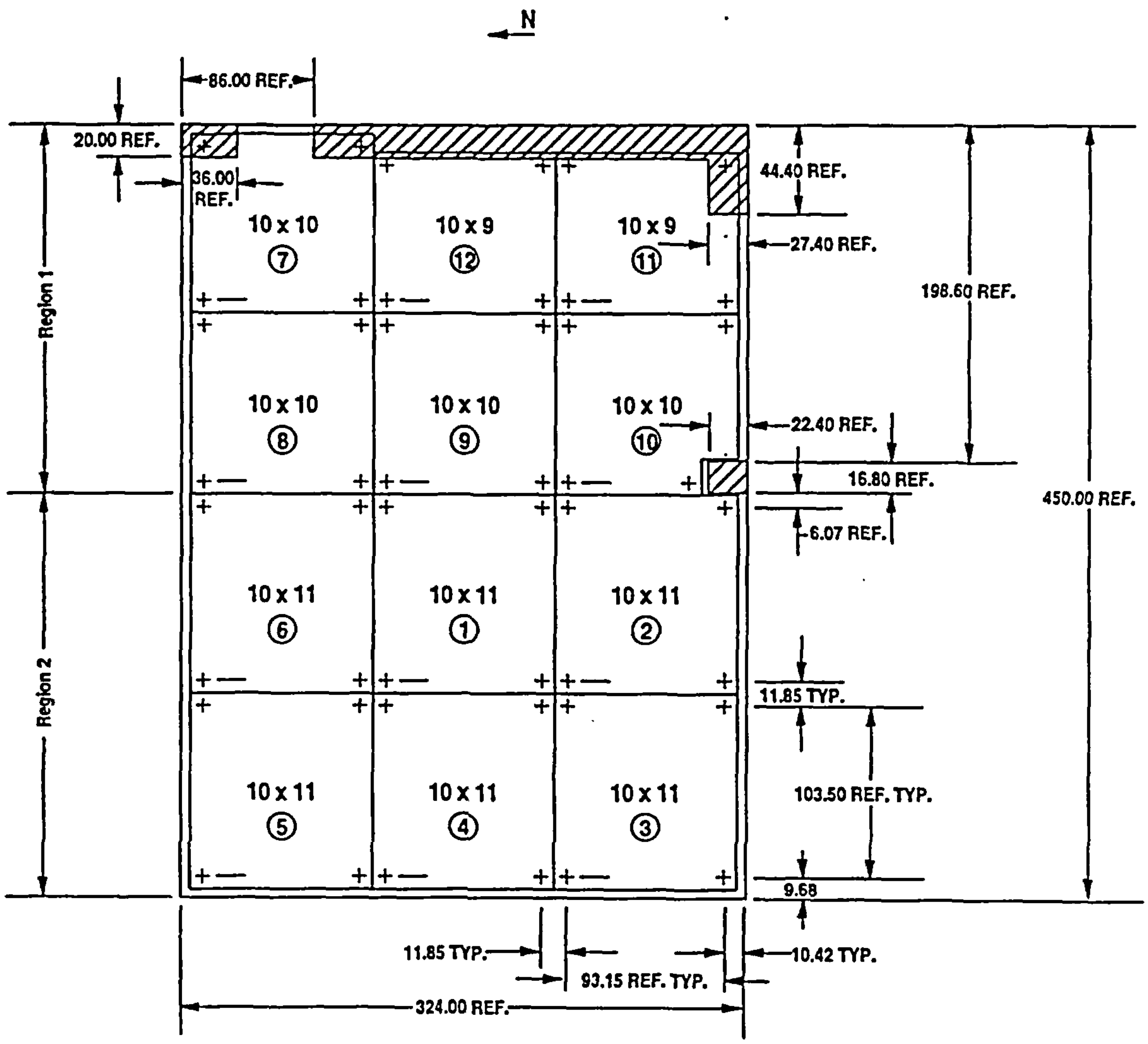


FIGURE 2

Seabrook Spent Fuel Pool Layout



SECTION II

MARKUP OF PROPOSED CHANGE

Refer to the attached markup of the proposed change to the Technical Specifications. The attached markup reflects the currently issued revision of the Technical Specifications listed below. Pending Technical Specifications or Technical Specification changes issued subsequent to this submittal are not reflected in the enclosed markup.

The following Technical Specifications are included in the attached markup:

Technical Specification	Title	Page
INDEX	INDEX	ix, xii
3/4.9.13	Spent Fuel Assembly Storage	3/4 9-16
Figure 3.9-1	Fuel Assembly Burnup vs. Initial Enrichment For Spent Fuel Assemblies in BORAL® Storage Racks	3/4 9-17
Figure 3.9-2	Fuel Assembly Burnup vs. Initial Enrichment For Spent Fuel Assemblies in BORAFLEX® Storage Racks	3/4 9-17A
3/4.9.14	New Fuel Assembly Storage	3/4 9-18
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FIGURE 3.9-2 FUEL ASSEMBLY BURNUP VS. INITIAL ENRICHMENT FOR SPENT FUEL ASSEMBLIES IN BORAFLEX STORAGE 3/4 9-17A

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LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

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3/4.9.13 SPENT FUEL ASSEMBLY STORAGE

LIMITING CONDITION FOR OPERATION

3.9.13 Fuel assemblies stored in the Spent Fuel Pool shall be placed in the spent fuel storage racks according to the criteria shown in Figures 3.9-1 and 3.9-2.

APPLICABILITY: Whenever fuel is in the Spent Fuel Pool.

ACTION:

a. With the requirements of the above specification not satisfied, suspend all other fuel movement within the Spent Fuel Pool and move the non-complying fuel assemblies to allowable locations in the Spent Fuel Pool in accordance with Figures 3.9-1 and 3.9-2.

b. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.13.1 The its burnup of each fuel assembly to be stored in the Spent Fuel Pool shall be determined from ~~it's~~ measured burnup history prior to storage in the Spent Fuel Pool. A complete record of each assembly shall be maintained as long as that fuel assembly is retained on-site.

4.9.13.2 After fuel assembly~~(ies)~~ movement into or within the Spent Fuel Pool, the position of the fuel assembl~~y~~ies~~)~~ that ~~was (~~were~~)~~ moved shall be ~~checked and independently~~ verified by administrative means to be in accordance with the criteria in Figures 3.9-1 and 3.9-2.

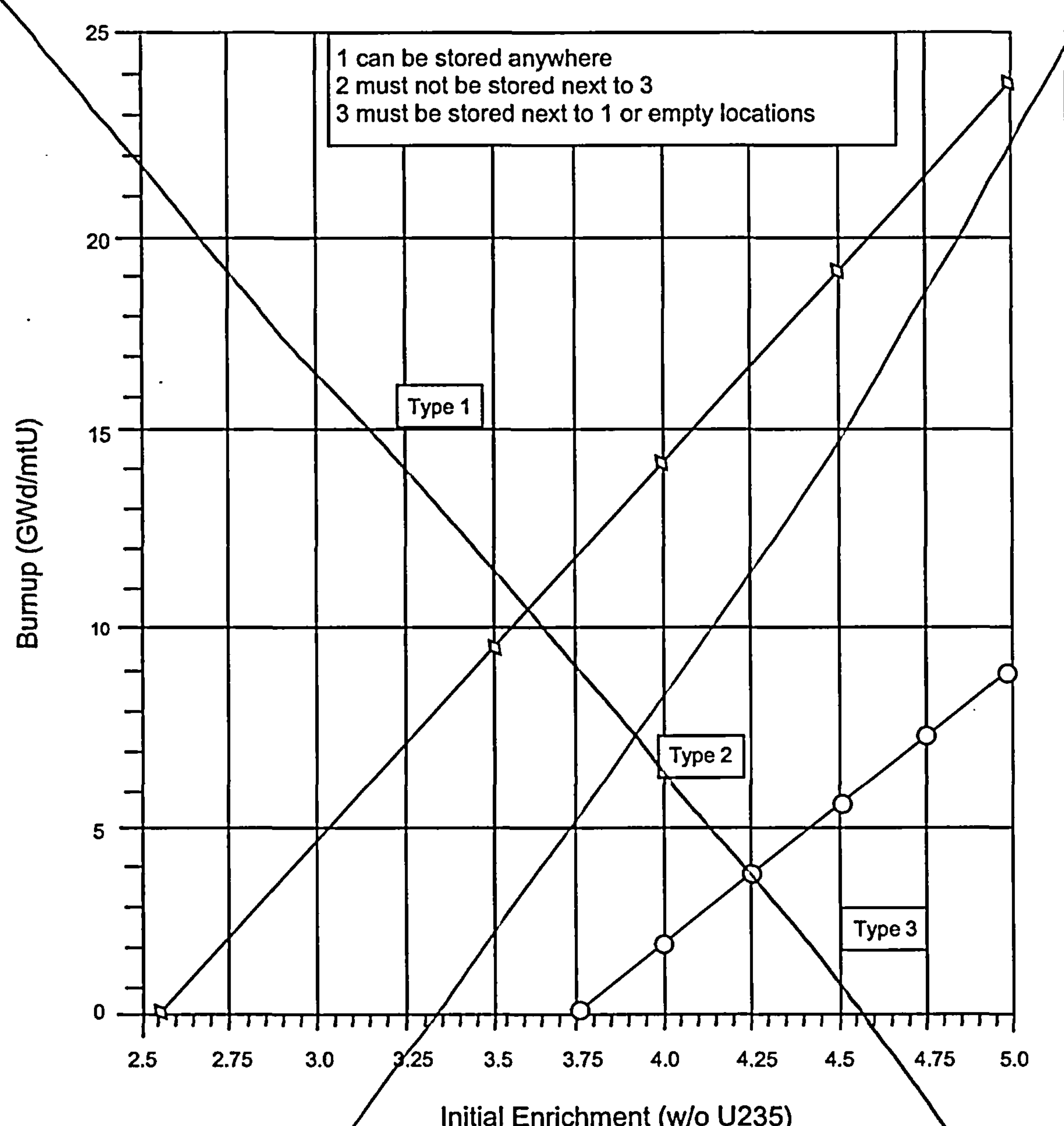

Figure 3.9-1
Fuel Assembly Burnup vs. Initial Enrichment
For Spent Fuel Assembly Storage

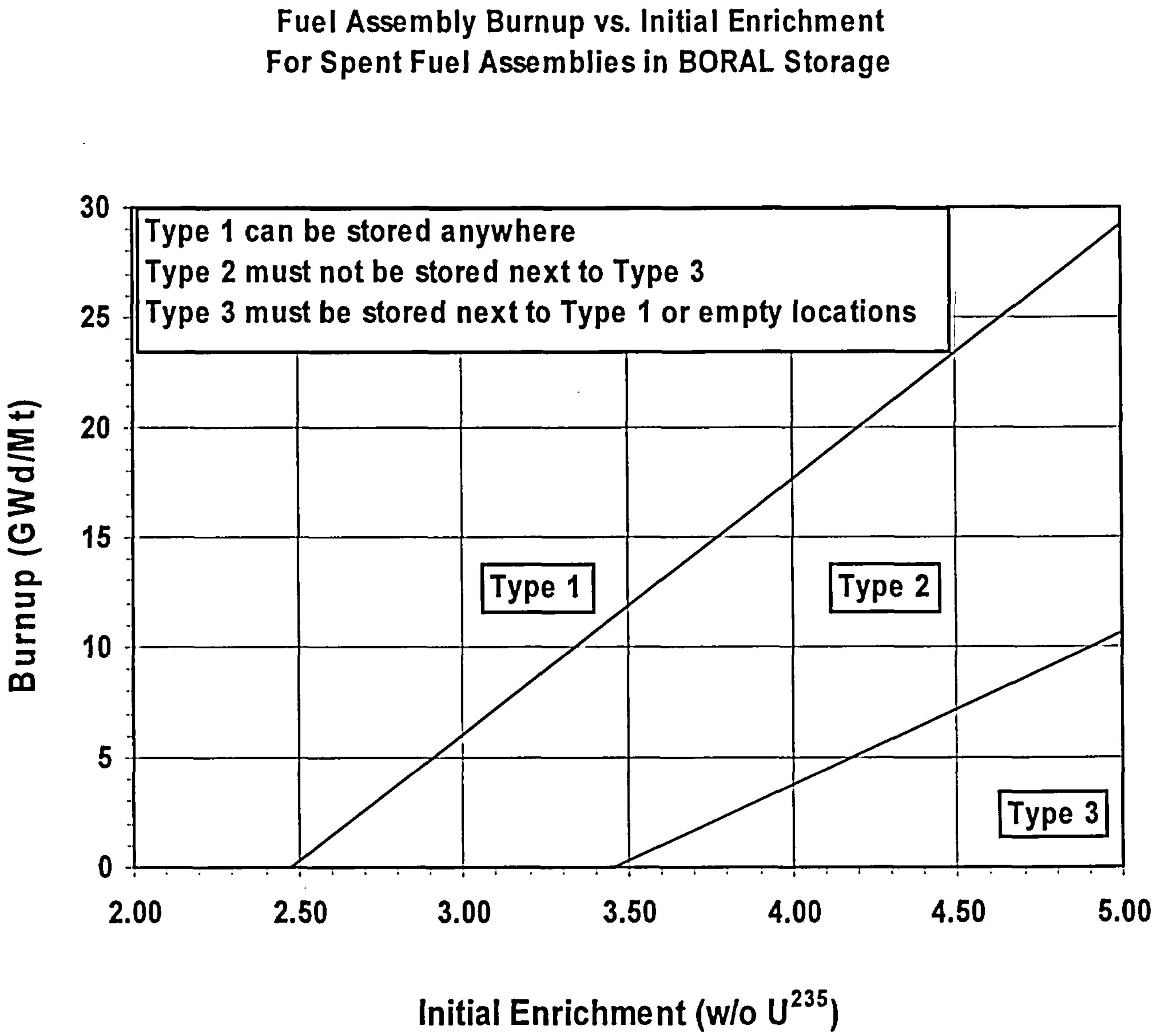

Figure 3.9-1
Fuel Assembly Burnup vs. Initial Enrichment
For Fuel Assemblies in BORAL Storage

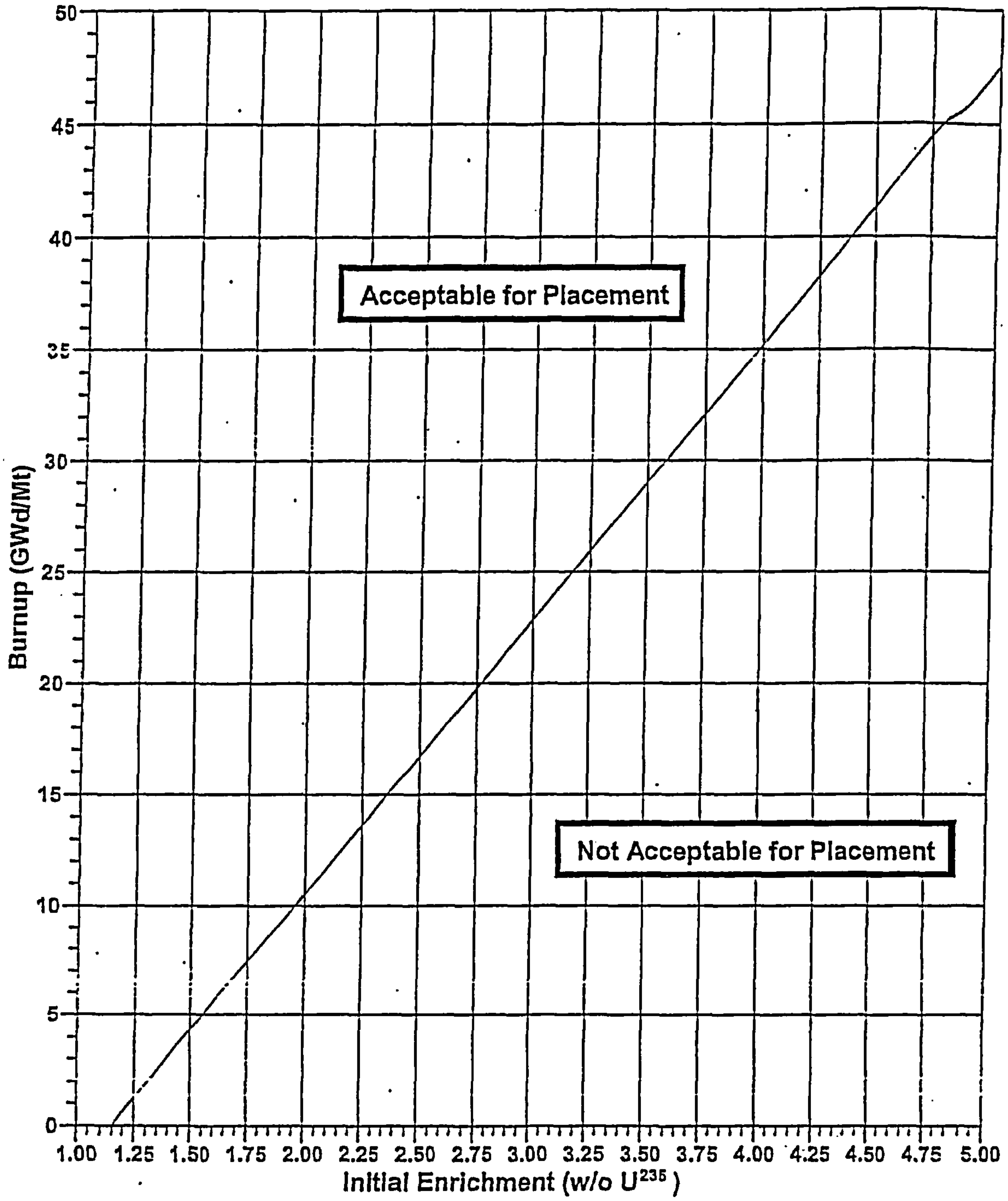

Figure 3.9-2
Fuel Assembly Burnup vs. Initial Enrichment
For Spent Fuel Assemblies in BORAFLEX® Storage

3/4.9.14 NEW FUEL ASSEMBLY STORAGE

LIMITING CONDITION FOR OPERATION

3.9.14 The New Fuel Storage Vault may be maintained with a full loading of 90 assemblies with fuel enrichment up to 3.675 w/o ^{235}U. The loading must be reduced to 81 assemblies for enrichments from 3.675 to 5.0 w/o ^{235}U by limiting the fuel assembly placement in the central column of the New Fuel Storage Vault to every other location.

APPLICABILITY: Whenever fuel is in the New Fuel Storage Vault.

ACTION:

a. With the requirements of the above specification not satisfied, suspend all other fuel movement within the New Fuel Storage Vault and move the non-complying fuel assemblies to allowable locations in the New Fuel Storage Vault in accordance with the requirements of the above specification.

b. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.14.1 After fuel assembly(ies) movement into or within the New Fuel Storage Vault, the position of the new fuel assembly(ies) that (was) (were) moved shall be checked and independently verified to be in accordance with the requirements of the above specification.

(by administrative means)

3/4.9.15 SPENT FUEL POOL BORON CONCENTRATION

LIMITING CONDITION FOR OPERATION

3.9.15 The spent fuel pool boron concentration shall be greater than or equal to 900 ppm.

APPLICABILITY: During movement of fuel assemblies within the spent fuel pool until the fuel assemblies have been verified to be properly stored in accordance with Surveillance Requirement 4.9.13.2.

ACTION:

With the spent fuel pool boron less than 900 ppm:

a. Suspend the movement of fuel assemblies within the spent fuel pool; and

b. Initiate action to restore spent fuel pool boron concentration within limit.

c. The provisions of Specification 3.0.3 are not applicable

SURVEILLANCE REQUIREMENTS

4.9.15 Verify the boron concentration of the spent fuel pool is within limit at least once per 7 days.

BASES

3/4.9.9 (THIS SPECIFICATION NUMBER IS NOT USED.)

3/4.9.10 and 3/4.9.11 WATER LEVEL - REACTOR VESSEL and STORAGE POOL

The restrictions on minimum water level ensure that sufficient water depth is available to remove 99% of the assumed 10% iodine gap activity released from the rupture of an irradiated fuel assembly. The minimum water depth is consistent with the assumptions of the safety analysis.

3/4.9.12 FUEL STORAGE BUILDING EMERGENCY AIR CLEANING SYSTEM

The limitations on the Fuel Storage Building Emergency Air Cleaning System ensure that all radioactive material released from an irradiated fuel assembly will be filtered through the HEPA filters and charcoal adsorber prior to discharge to the atmosphere. Operation of the system with the heaters operating for at least 10 continuous hours in a 31-day period is sufficient to reduce the buildup of moisture on the adsorbers and HEPA filters. The OPERABILITY of this system and the resulting iodine removal capacity are consistent with the assumptions of the safety analyses. ANSI N510-1980 will be used as a procedural guide for surveillance testing.

3/4.9.13 SPENT FUEL ASSEMBLY STORAGE

Restrictions on placement of fuel assemblies of certain enrichments within the Spent Fuel Pool is dictated by Figure 3.9-1. These restrictions ensure that the K_{eff} of the Spent Fuel Pool will always remain less than 0.95 assuming the pool to be flooded with unborated water. The restrictions delineated in Figure 3.9-1 and the action statement are consistent with the criticality safety analysis performed for the Spent Fuel Pool as documented in the FSAR.

3/4.9.14 NEW FUEL ASSEMBLY STORAGE

Restrictions on placement of fuel assemblies of certain enrichments within the New Fuel Storage Vault is dictated by Specification 3/4.9.14. These restrictions ensure that the K_{eff} of the New Fuel Storage Vault will always remain less than 0.95 assuming the area to be flooded with unborated water. In addition, these restrictions ensure that the K_{eff} of the New Fuel Storage Vault will always remain less than 0.98 when aqueous foam moderation is assumed. The restrictions delineated in Specification 3/4.9.14 and the action statement are consistent with the criticality safety analysis performed for the New Fuel Storage Vault as documented in the FSAR.

3/4.9.15 SPENT FUEL POOL BORON CONCENTRATION

The limitation on boron concentration in the spent fuel pool ensures that in the event a fuel assembly is misplaced within a Boral or Boraflex storage rack, or placed outside the racks at various pool locations, that k_{eff} will remain $\leq$ 0.95. A round value of 900 ppm includes 872 ppm required by the spent fuel pool criticality analysis and 10 ppm for measurement uncertainty.

SECTION III

RETYPE OF PROPOSED CHANGE

Refer to the attached retype of the proposed change to the Technical Specifications. The attached retype reflects the currently issued version of the Technical Specifications. Pending Technical Specification changes or Technical Specification changes issued subsequent to this submittal are not reflected in the enclosed retype. The enclosed retype should be checked for continuity with Technical Specifications prior to issuance.

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5.0 DESIGN FEATURES

3/4.9.13 SPENT FUEL ASSEMBLY STORAGE

LIMITING CONDITION FOR OPERATION

3.9.13 Fuel assemblies stored in the Spent Fuel Pool shall be placed in the spent fuel storage racks according to the criteria shown in Figures 3.9-1 and 3.9-2.

APPLICABILITY: Whenever fuel is in the Spent Fuel Pool.

ACTION:

a. With the requirements of the above specification not satisfied, suspend all other fuel movement within the Spent Fuel Pool and move the non-complying fuel assemblies to allowable locations in the Spent Fuel Pool in accordance with Figures 3.9-1 and 3.9-2.

b. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.13.1 The burnup of each fuel assembly to be stored in the Spent Fuel Pool shall be determined from its measured burnup history prior to storage in the Spent Fuel Pool. A complete record of each assembly shall be maintained as long as that fuel assembly is retained on-site.

4.9.13.2 After fuel assembly movement into or within the Spent Fuel Pool, the position of the fuel assemblies that were moved shall be verified by administrative means to be in accordance with the criteria in Figures 3.9-1 and 3.9-2.

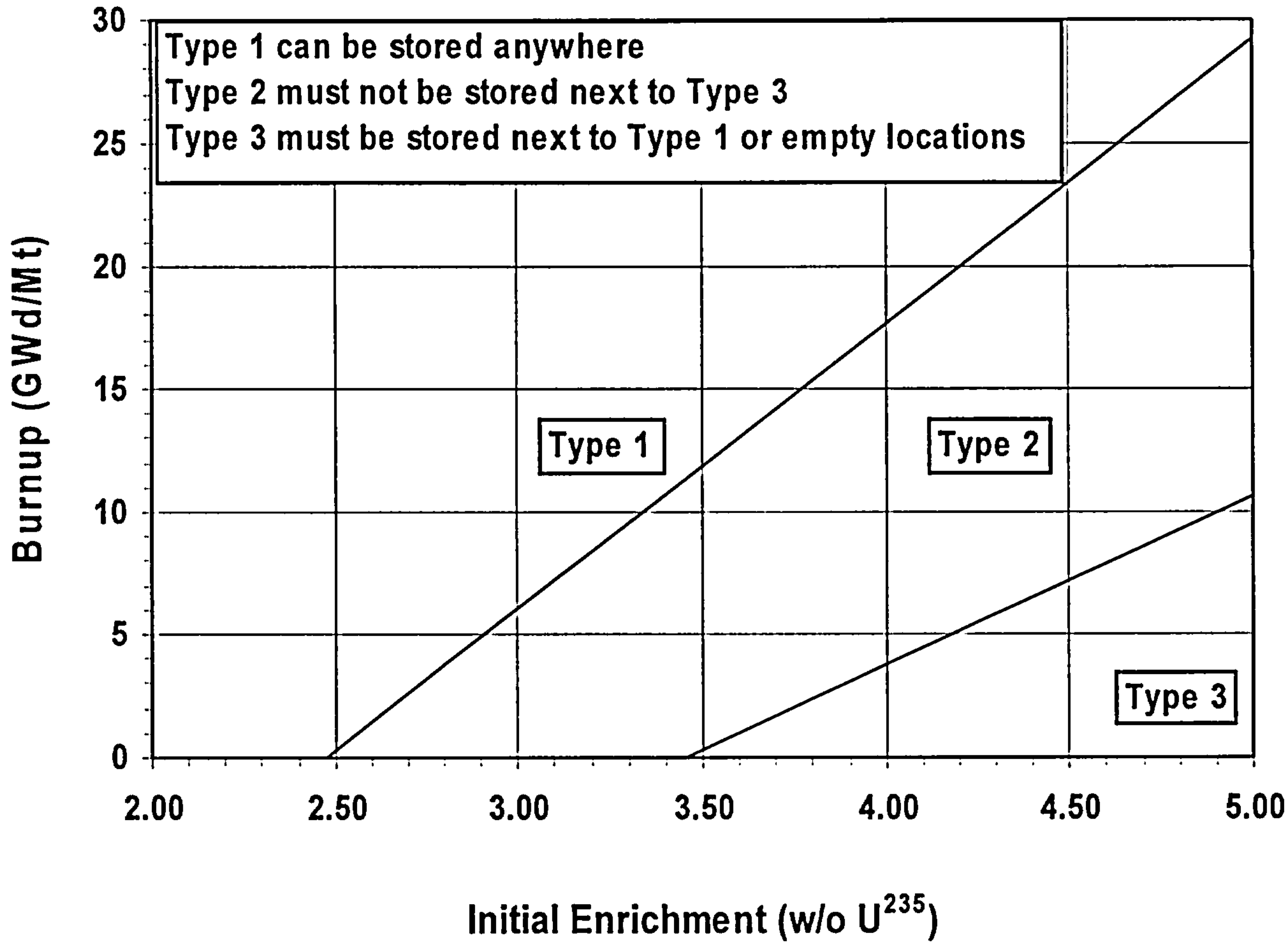

Figure 3.9-1
Fuel Assembly Burnup vs. Initial Enrichment
For Fuel Assemblies in BORAL Storage

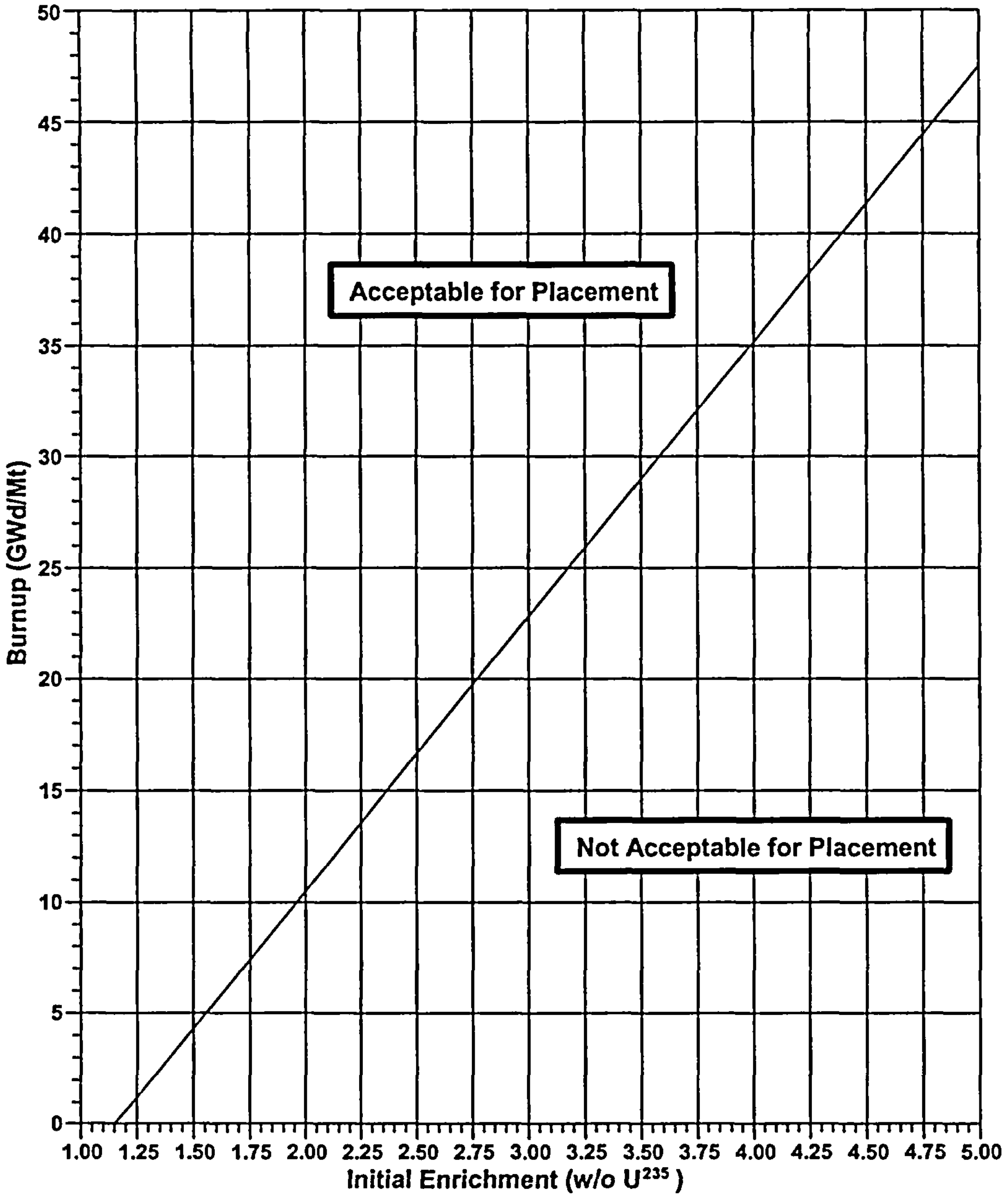

Figure 3.9-2
Fuel Assembly Burnup vs. Initial Enrichment
For Spent Fuel Assemblies in BORAFLEX® Storage Racks

3/4.9.14 NEW FUEL ASSEMBLY STORAGE

LIMITING CONDITION FOR OPERATION

3.9.14 The New Fuel Storage Vault may be maintained with a full loading of 90 assemblies with fuel enrichment up to 3.675 w/o ^{235}U. The loading must be reduced to 81 assemblies for enrichments from 3.675 to 5.0 w/o ^{235}U by limiting the fuel assembly placement in the central column of the New Fuel Storage Vault to every other location.

APPLICABILITY: Whenever fuel is in the New Fuel Storage Vault.

ACTION:

a. With the requirements of the above specification not satisfied, suspend all other fuel movement within the New Fuel Storage Vault and move the non-complying fuel assemblies to allowable locations in the New Fuel Storage Vault in accordance with the requirements of the above specification.

b. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.14.1 After fuel assembly movement into or within the New Fuel Storage Vault, the position of the new fuel assemblies that were moved shall be verified by administrative means to be in accordance with the requirements of the above specification.

3/4.9.15 SPENT FUEL POOL BORON CONCENTRATION

LIMITING CONDITION FOR OPERATION

3.9.15 The spent fuel pool boron concentration shall be greater than or equal to 900 ppm.

APPLICABILITY: During movement of fuel assemblies within the spent fuel pool until the fuel assemblies have been verified to be properly stored in accordance with Surveillance Requirement 4.9.13.2.

ACTION:

With the spent fuel pool boron less than 900 ppm:

a. Suspend the movement of fuel assemblies within the spent fuel pool; and

b. Initiate action to restore spent fuel pool boron concentration within limit.

c. The provisions of Specification 3.0.3 are not applicable

SURVEILLANCE REQUIREMENTS

4.9.15 Verify the boron concentration of the spent fuel pool is within limit at least once per 7 days.

3/4.9.9 (THIS SPECIFICATION NUMBER IS NOT USED.)

3/4.9.10 and 3/4.9.11 WATER LEVEL - REACTOR VESSEL and STORAGE POOL

The restrictions on minimum water level ensure that sufficient water depth is available to remove 99% of the assumed 10% iodine gap activity released from the rupture of an irradiated fuel assembly. The minimum water depth is consistent with the assumptions of the safety analysis.

3/4.9.12 FUEL STORAGE BUILDING EMERGENCY AIR CLEANING SYSTEM

The limitations on the Fuel Storage Building Emergency Air Cleaning System ensure that all radioactive material released from an irradiated fuel assembly will be filtered through the HEPA filters and charcoal adsorber prior to discharge to the atmosphere. Operation of the system with the heaters operating for at least 10 continuous hours in a 31-day period is sufficient to reduce the buildup of moisture on the adsorbers and HEPA filters. The OPERABILITY of this system and the resulting iodine removal capacity are consistent with the assumptions of the safety analyses. ANSI N510-1980 will be used as a procedural guide for surveillance testing.

3/4.9.13 SPENT FUEL ASSEMBLY STORAGE

Restrictions on placement of fuel assemblies of certain enrichments within the Spent Fuel Pool are dictated by Figures 3.9-1 and 3.9-2. These restrictions ensure that the K_{eff} of the Spent Fuel Pool will always remain less than 0.95 assuming the pool to be flooded with unborated water. The restrictions delineated in Figures 3.9-1 and 3.9-2 and the action statement are consistent with the criticality safety analysis performed for the Spent Fuel Pool as documented in the UFSAR.

3/4.9.14 NEW FUEL ASSEMBLY STORAGE

Restrictions on placement of fuel assemblies of certain enrichments within the New Fuel Storage Vault is dictated by Specification 3/4.9.14. These restrictions ensure that the K_{eff} of the New Fuel Storage Vault will always remain less than 0.95 assuming the area to be flooded with unborated water. In addition, these restrictions ensure that the K_{eff} of the New Fuel Storage Vault will always remain less than 0.98 when aqueous foam moderation is assumed. The restrictions delineated in Specification 3/4.9.14 and the action statement are consistent with the criticality safety analysis performed for the New Fuel Storage Vault as documented in the UFSAR.

BASES

3/4.9.15 SPENT FUEL POOL BORON CONCENTRATION

The limitation on boron concentration in the spent fuel pool ensures that in the event a fuel assembly is misplaced within a Boral or Boraflex storage rack, or placed outside the racks at various pool locations, that k_{eff} will remain ≤ 0.95. A round value of 900 ppm includes 872 ppm required by the spent fuel pool criticality analysis and 10 ppm for measurement uncertainty.

SECTION IV

DETERMINATION OF SIGNIFICANT HAZARDS FOR PROPOSED CHANGE

IV. DETERMINATION OF SIGNIFICANT HAZARDS FOR PROPOSED CHANGE

LAR 04-05 proposes changes to Seabrook Station Technical Specification (TS) 3/4.9.13, Spent Fuel Assembly Storage and associated TS Figures, Index and Bases; and TS 3/4.9.14, New Fuel Assembly Storage. The proposed changes reflect a revised criticality safety analysis supporting a two-zone spent fuel pool, consisting of BORAFLEX® and BORAL® fuel assembly storage racks. In addition, this proposed change adds a new Technical Specification, TS 3/4.9.15, Spent Fuel Pool Boron Concentration, and accompanying bases as a result of the criticality analysis that supports a two-zone spent fuel pool. This change updates and makes minor corrections to the existing TS bases; and a bases section is added for new TS 3/4.9.15, Spent Fuel Pool boron Concentration. The UFSAR will be updated as necessary to incorporate the results of the revised criticality analysis.

In accordance with 10 CFR 50.92, FPL Energy Seabrook has concluded that the proposed changes do not involve a significant hazards consideration (SHC). The basis for the conclusion that the proposed changes do not involve a SHC is as follows:

1. *The proposed changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.*

   The proposed license amendment incorporates the results of a revised criticality analysis for the spent fuel pool without making any physical changes to the facility. The revised criticality analysis for the spent fuel pool (1) credits boron during movement of fuel in the spent fuel pool, (2) assumes no neutron-absorbing material in the BORAFLEX® storage racks, and (3) applies a conservative penalty in the analysis of BORAL® racks. These changes do not increase the probability of a fuel assembly being misplaced within the spent fuel pool. The movement of fuel assemblies will continue to be controlled by approved procedures, and the placement of spent fuel will be controlled by the revised Technical Specifications. The proposed changes do not alter or prevent the ability of structures, systems or components (SSCs) to perform their intended function to mitigate the consequences of an initiating event within the acceptance limits assumed in the Updated Final Safety Analysis Report (UFSAR).

   The proposed changes do not affect the source term, containment isolation or radiological release assumptions used in evaluating the radiological consequences of an accident previously evaluated in the Seabrook Station UFSAR. The consequences of a misplaced fuel assembly are not increased because the analysis demonstrates that the fuel will remain sub-critical with a minimum of 872 ppm boron in the spent fuel pool. The new technical specification included in this proposed change will ensure that the minimum boron concentration is established during the movement of fuel in the spent fuel pool. Further, the proposed changes neither increase the types and amounts of radioactivity released offsite nor increase occupational or public radiation exposures.

Therefore, the proposed changes do not involve a significant increase in the probability or consequence of an accident previously evaluated.

2. *The proposed changes do not create the possibility of a new or different kind of accident from any previously evaluated.*

The proposed changes to the TS do not alter the operation of the spent fuel storage system or its ability to perform its design function. The proposed changes do not include any physical changes to the plant and do not introduce a new or different accident from any type previously evaluated. A misplaced fuel assembly does not represent a new or different type accident, and the analysis shows that the fuel remains sub-critical for the limiting case of a misplaced fuel assembly. Similarly, continuing to take credit for boron in the spent fuel under accident conditions does not create the possibility of a new or different kind of accident. The previous criticality analyses took credit for soluble boron in the spent fuel pool water to show acceptable results in the analyses of fuel misloading events.

Therefore, the proposed changes do not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. *The proposed changes do not involve a significant reduction in the margin of safety.*

The changes proposed by this license amendment ensure that the spent fuel will remain sub-critical under normal and accident conditions. The controlled placement of fuel assemblies within the spent fuel pool will maintain K_{eff} less than or equal to 0.95 as required by TS 5.6.1.1 for spent fuel storage. The proposed amendment maintains the 0.95 limit on K_{eff} by restricting the placement of spent fuel and by crediting soluble boron in the fuel pool water.

To assure that the true reactivity will be less than the calculated reactivity, the analyses contain conservative assumptions for calculating the safety limits for the spent fuel rack. With this proposed change, K_{eff} will be less than or equal to 0.95 with a 95% probability at a 95% confidence level.

Therefore, the proposed changes do not involve a significant reduction in a margin of safety.

Based on the above evaluation, FPL Energy Seabrook concludes that the proposed changes to the TS do not constitute a significant hazard.

SECTION V and VI

PROPOSED SCHEDULE FOR LICENSE AMENDMENT ISSUANCE AND EFFECTIVENESS, AND ENVIRONMENTAL IMPACT ASSESSMENT

V. PROPOSED SCHEDULE FOR LICENSE AMENDMENT ISSUANCE AND EFFECTIVENESS

FPL Energy Seabrook requests NRC review of License Amendment Request 04-05, and issuance of a license amendment by March 31, 2006, having immediate effectiveness and implementation within 90 days.

VI. ENVIRONMENTAL IMPACT ASSESSMENT

FPL Energy Seabrook has reviewed the proposed license amendment against the criteria of 10 CFR 51.22 for environmental considerations. The proposed changes do not involve a significant hazards consideration, nor increase the types and amounts of effluent that may be released offsite, nor significantly increase individual or cumulative occupational radiation exposures. Based on the foregoing, FPL Energy Seabrook concludes that the proposed changes meet the criteria delineated in 10 CFR 51.22(c)(9) for a categorical exclusion from the requirements for an Environmental Impact Statement.