3.7 PLANT SYSTEMS

3.7.15 Fuel Storage Pool Boron Concentration

LCO 3.7.15 The fuel storage pool boron concentration shall be ≥ 2150 ppm.

APPLICABILITY: When fuel assemblies are stored in the fuel storage pool and a fuel storage pool verification has not been performed since the last movement of fuel assemblies in the fuel storage pool.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Fuel storage pool boron concentration not within limit.	------------NOTE------------ LCO 3.0.3 is not applicable. ----------------------------	
	A.1 Suspend movement of fuel assemblies in the fuel storage pool.	Immediately
	AND	
	A.2.1 Initiate action to restore fuel storage pool boron concentration to within limit.	Immediately
	OR	
	A.2.2 Initiate action to perform a fuel storage pool verification.	Immediately

3.7 PLANT SYSTEMS

3.7.17 Spent Fuel Assembly Storage

LCO 3.7.17 The combination of initial enrichment, and burnup of each fuel assembly stored in each of the three regions of the fuel storage pool shall be within the acceptable burnup domain for each region as shown in Figures 3.7.17-1 and described in Specification 4.3.1.1.

, and decay time
four
, 3.7.17-2, or 3.7.17-3,

APPLICABILITY: Whenever any fuel assembly is stored in the fuel storage pool.

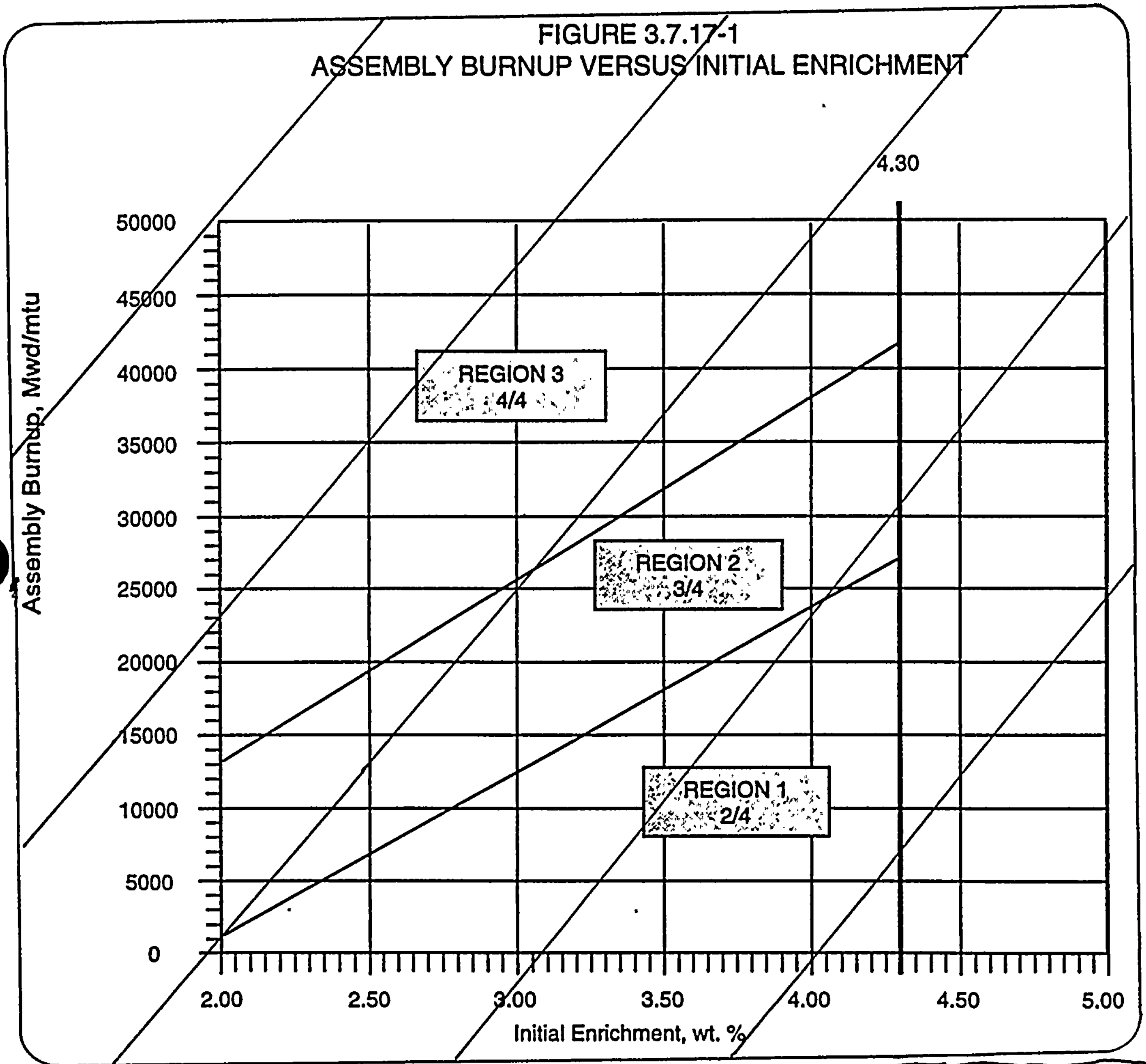
ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Requirements of the LCO not met.	A.1	--------NOTE-------- LCO 3.0.3 is not applicable. -------------------- Initiate action to move the noncomplying fuel assembly into an appropriate region.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.17.1	Verify by administrative means the initial enrichment, and burnup of the fuel assembly is in accordance with Figures 3.7.17-1 and Specification 4.3.1.1. , and decay time , 3.7.17-2, or 3.7.17-3,	Prior to storing the fuel assembly in the fuel storage pool.

FIGURE 3.7.17-1
ASSEMBLY BURNUP VERSUS INITIAL ENRICHMENT



→ Insert new Figures 3.7.17-1, 3.7.17-2, and 3.7.17-3 (pages 3.7.17-2, 3.7.17-3, and 3.7.17-4)

Figure 3.7.17-1
ASSEMBLY BURNUP VERSUS INITIAL ENRICHMENT
for
Region 2

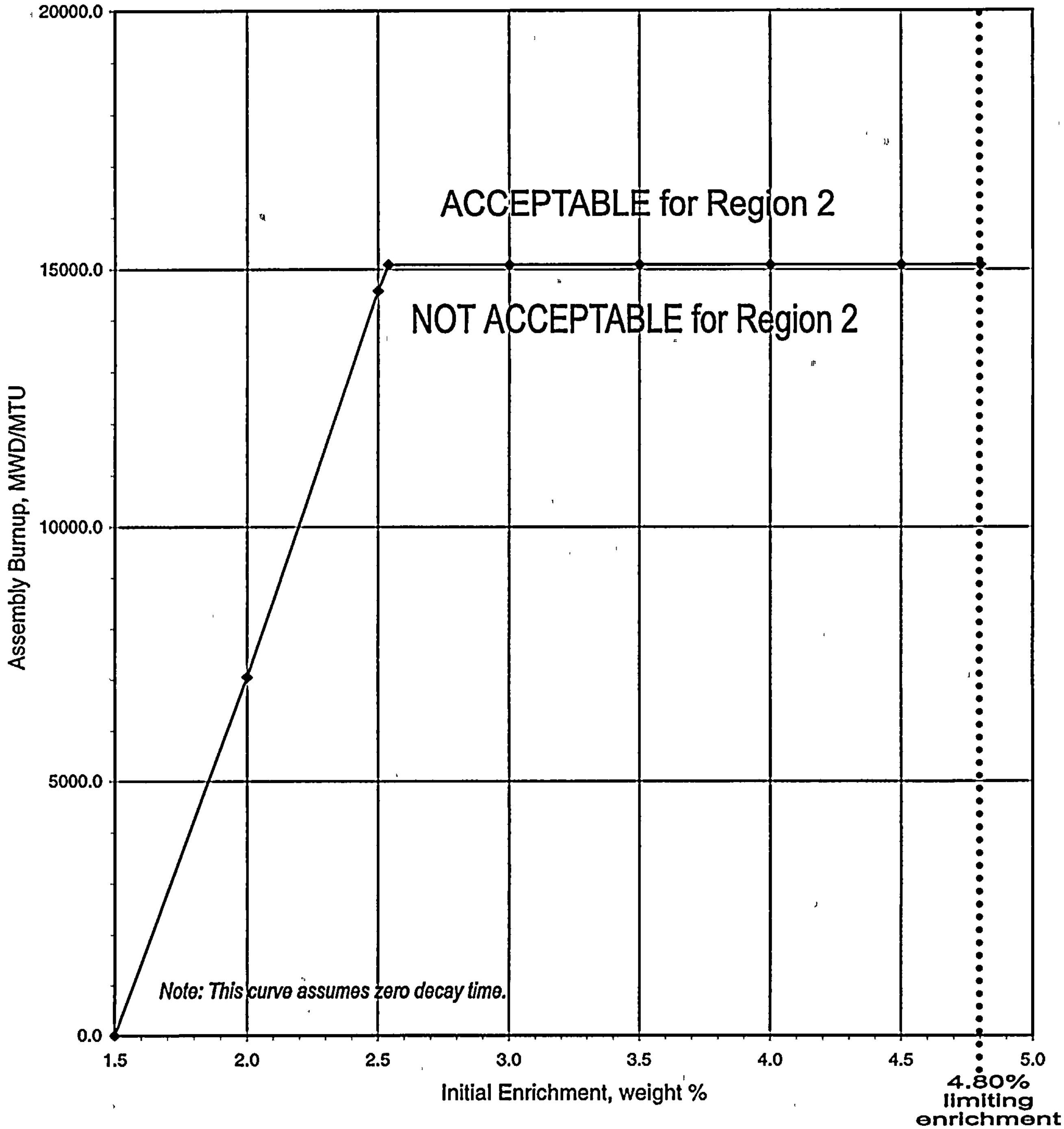


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Figure 3.7.17-2
ASSEMBLY BURNUP VERSUS INITIAL ENRICHMENT
for
Region 3
(at decay times from 0 to 20 years)

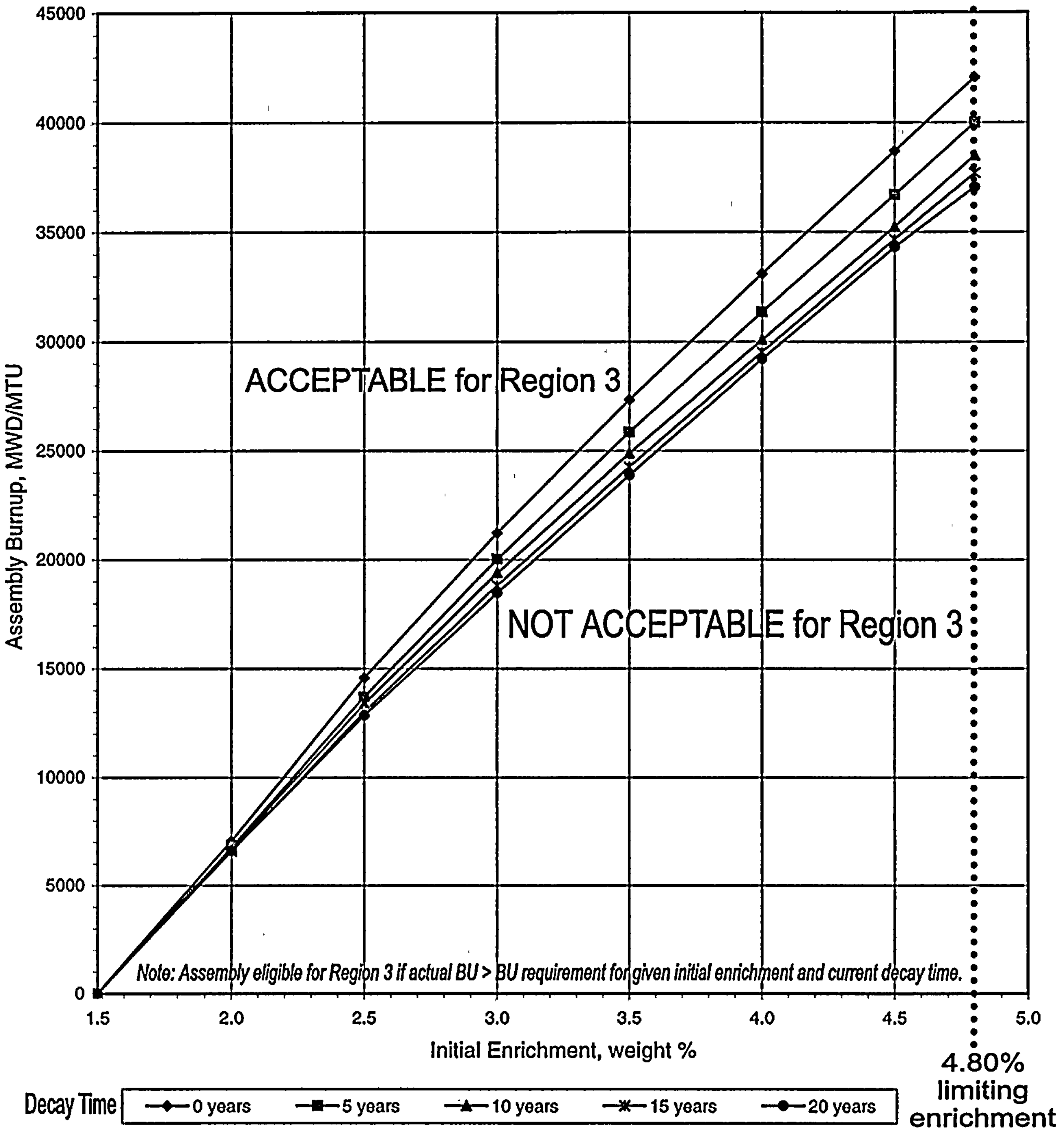

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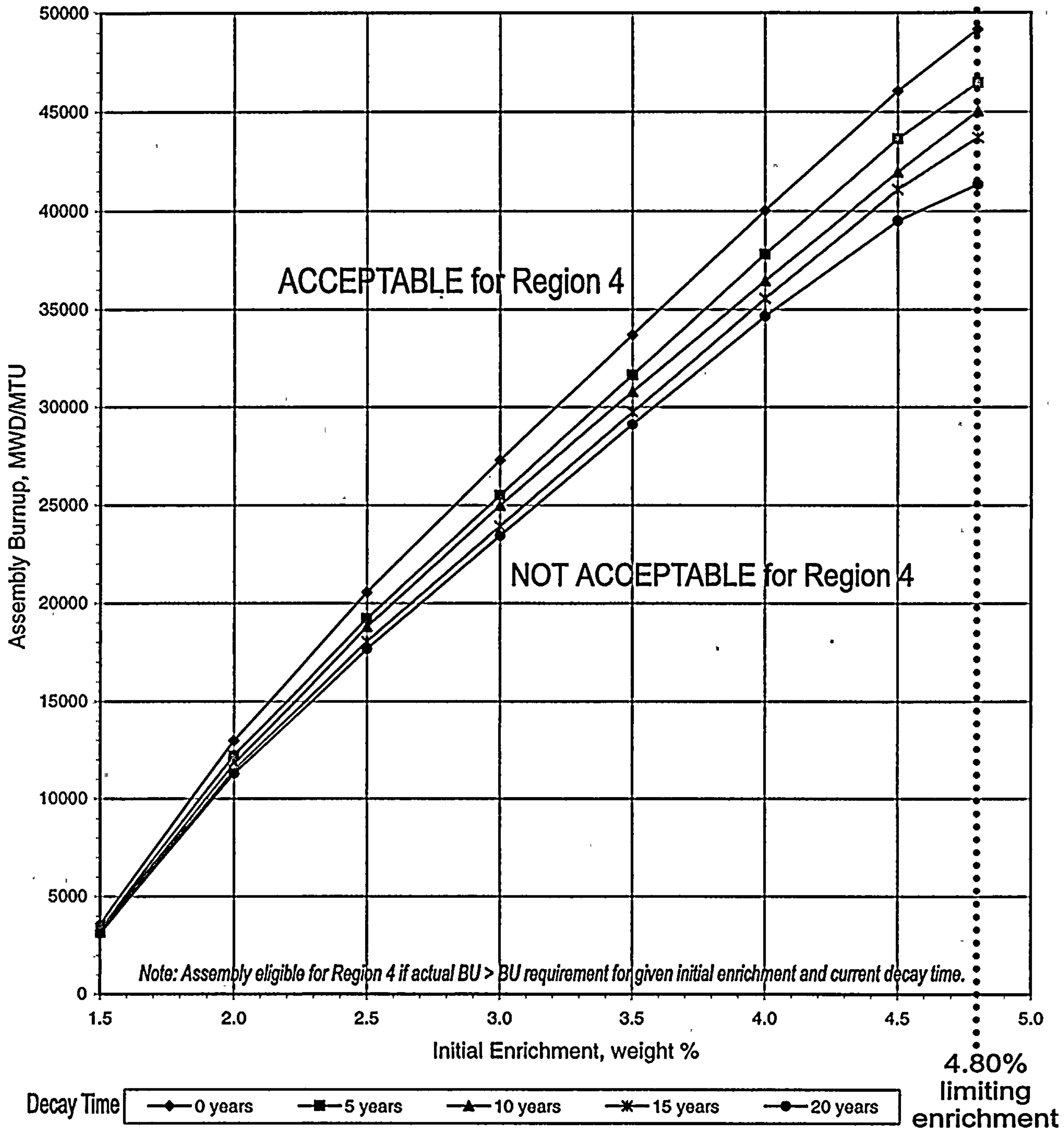
Figure 3.7.17-3
ASSEMBLY BURNUP VERSUS INITIAL ENRICHMENT
for
Region 4
(at decay times from 0 to 20 years)



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4.0 DESIGN FEATURES (continued)

4.3 Fuel Storage

4.3.1 Criticality

4.3.1.1 The spent fuel storage racks are designed and shall be maintained with:

a. Fuel assemblies having a maximum radially averaged U-235 enrichment of 4.30 weight percent;

b. $k_{eff} \le 0.95$ if fully flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.1 of the UFSAR;

d. A nominal 9.5 inch center-to-center distance between adjacent storage cell locations.

e. Region 1: Fuel shall be stored in a checkerboard (two-out-of-four) storage pattern. Fuel that qualifies to be stored in Regions 1, 2, or 3 in accordance with Figure 3.7.17-1, may be stored in Region 1.

f. Region 2: Fuel shall be stored in a three-out-of-four storage pattern. Fuel that qualifies to be stored in Regions 2, or 3, in accordance with Figure 3.7.17-1, may be stored in Region 2.

g. Region 3: Fuel shall be stored in a four-out-of-four storage pattern. Only fuel that qualifies to be stored in Region 3 in accordance with Figure 3.7.17-1, shall be stored in Region 3.

4.3.1.2 The new fuel storage racks are designed and shall be maintained with:

a. Fuel assemblies having a maximum radially averaged U-235 enrichment of 4.30 weight percent;

b. $k_{eff} \le 0.95$ if fully flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.1 of the UFSAR;

(continued)

Insert Page
Technical Specification 4.3.1.1

Insert 1

c. k_{eff} ≤0.95 if fully flooded with water borated to 900 ppm, which includes an allowance for biases and uncertainties as described in Section 9.1 of the UFSAR.

Insert 2

Fuel shall be stored in a repeating 3-by-4 storage pattern in which Region 2 (two-out-of-twelve) assemblies and Region 4 (ten-out-of-twelve) assemblies are mixed as shown in Section 9.1 of the UFSAR. Only fuel

Insert 3

h. Region 4: Fuel shall be stored in a repeating 3-by-4 storage pattern in which Region 2 (two-out-of-twelve) assemblies and Region 4 (ten-out-of-twelve) assemblies are mixed as shown in Section 9.1 of the UFSAR. Only fuel that qualifies to be stored in Region 4 in accordance with Figure 3.7.17-3 shall be stored in Region 4.

4.0 DESIGN FEATURES (continued)

c. $k_{eff} \le 0.98$ if moderated by aqueous foam, which includes an allowance for uncertainties as described in Section 9.1 of the UFSAR; and

d. A nominal 17 inch center to center distance between fuel assemblies placed in the storage racks.

4.3.2 Drainage

The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 137 feet - 6 inches.

4.3.3 Capacity

The spent fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than 1329 fuel assemblies.

3.7 PLANT SYSTEMS

3.7.15 Fuel Storage Pool Boron Concentration

LCO 3.7.15 The fuel storage pool boron concentration shall be ≥ 2150 ppm.

APPLICABILITY: Whenever any fuel assembly is stored in the fuel storage pool.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Fuel storage pool boron concentration not within limit.	-------------NOTE------------- LCO 3.0.3 is not applicable. -----------------------------	
	A.1 Suspend movement of fuel assemblies in the fuel storage pool.	Immediately
	<u>AND</u>	
	A.2 Initiate action to restore fuel storage pool boron concentration to within limit.	Immediately

3.7 PLANT SYSTEMS

3.7.17 Spent Fuel Assembly Storage

LCO 3.7.17 The combination of initial enrichment, burnup, and decay time of each fuel assembly stored in each of the four regions of the fuel storage pool shall be within the acceptable burnup domain for each region as shown in Figures 3.7.17-1, 3.7.17-2, or 3.7.17-3, and described in Specification 4.3.1.1.

APPLICABILITY: Whenever any fuel assembly is stored in the fuel storage pool.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of the LCO not met.	A.1 --------NOTE--------- LCO 3.0.3 is not applicable. --------------------- Initiate action to move the noncomplying fuel assembly into an appropriate region.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.17.1	Verify by administrative means the initial enrichment, burnup, and decay time of the fuel assembly is in accordance with Figures 3.7.17-1, 3.7.17-2, or 3.7.17-3, and Specification 4.3.1.1.	Prior to storing the fuel assembly in the fuel storage pool.

Figure 3.7.17-1
ASSEMBLY BURNUP VERSUS INITIAL ENRICHMENT
for
Region 2

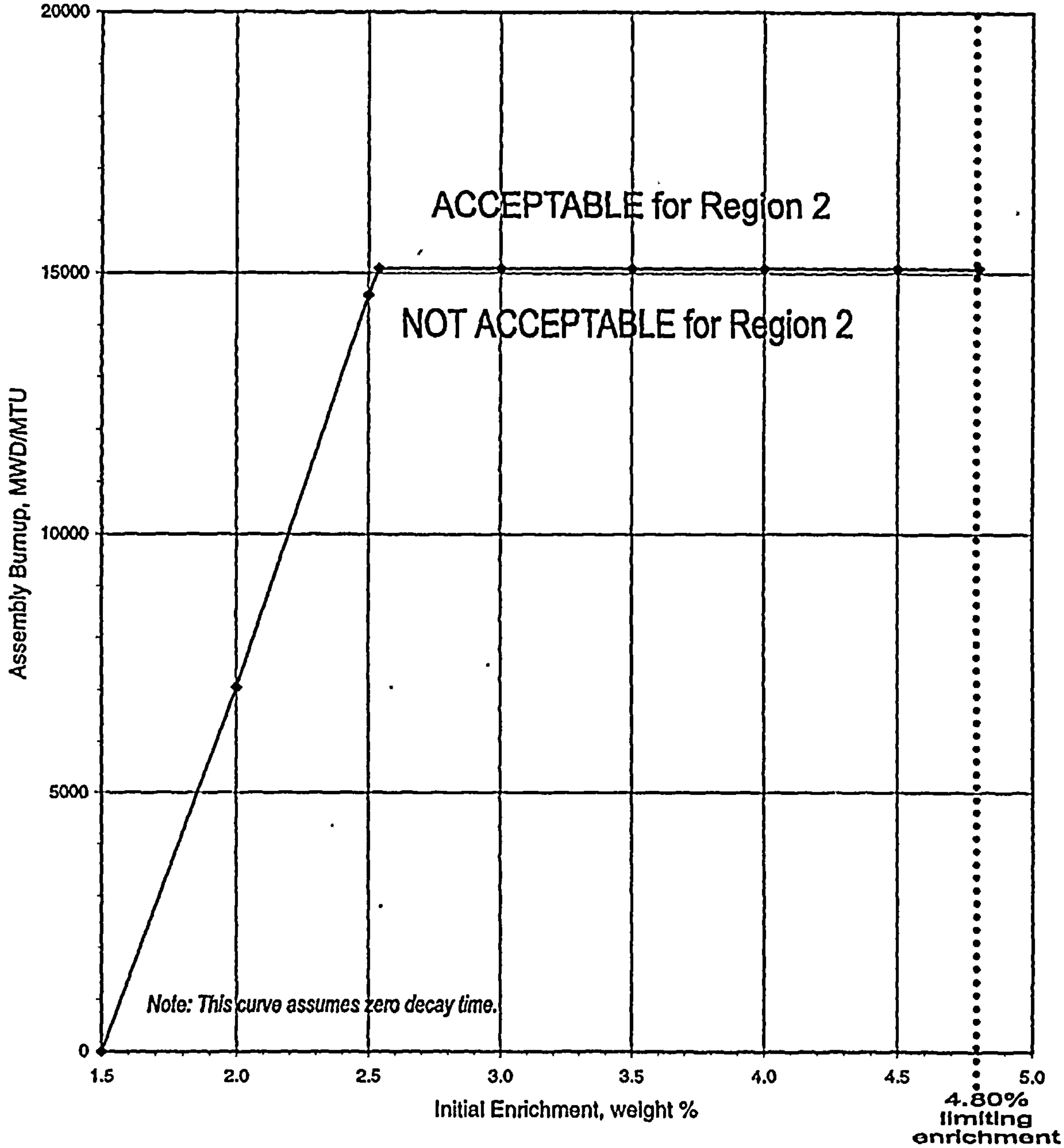


Figure 3.7.17-2
ASSEMBLY BURNUP VERSUS INITIAL ENRICHMENT
for
Region 3
(at decay times from 0 to 20 years)

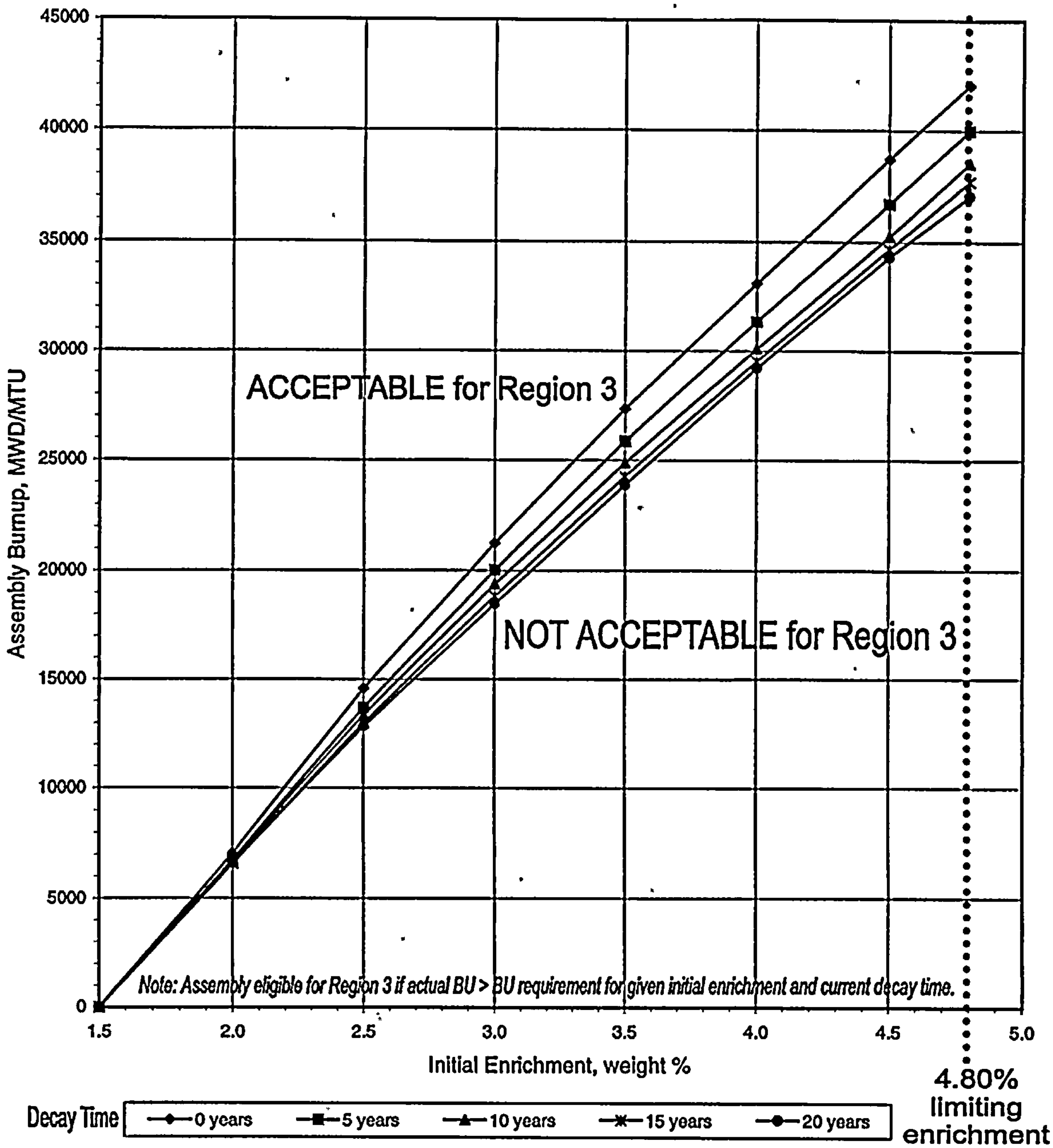
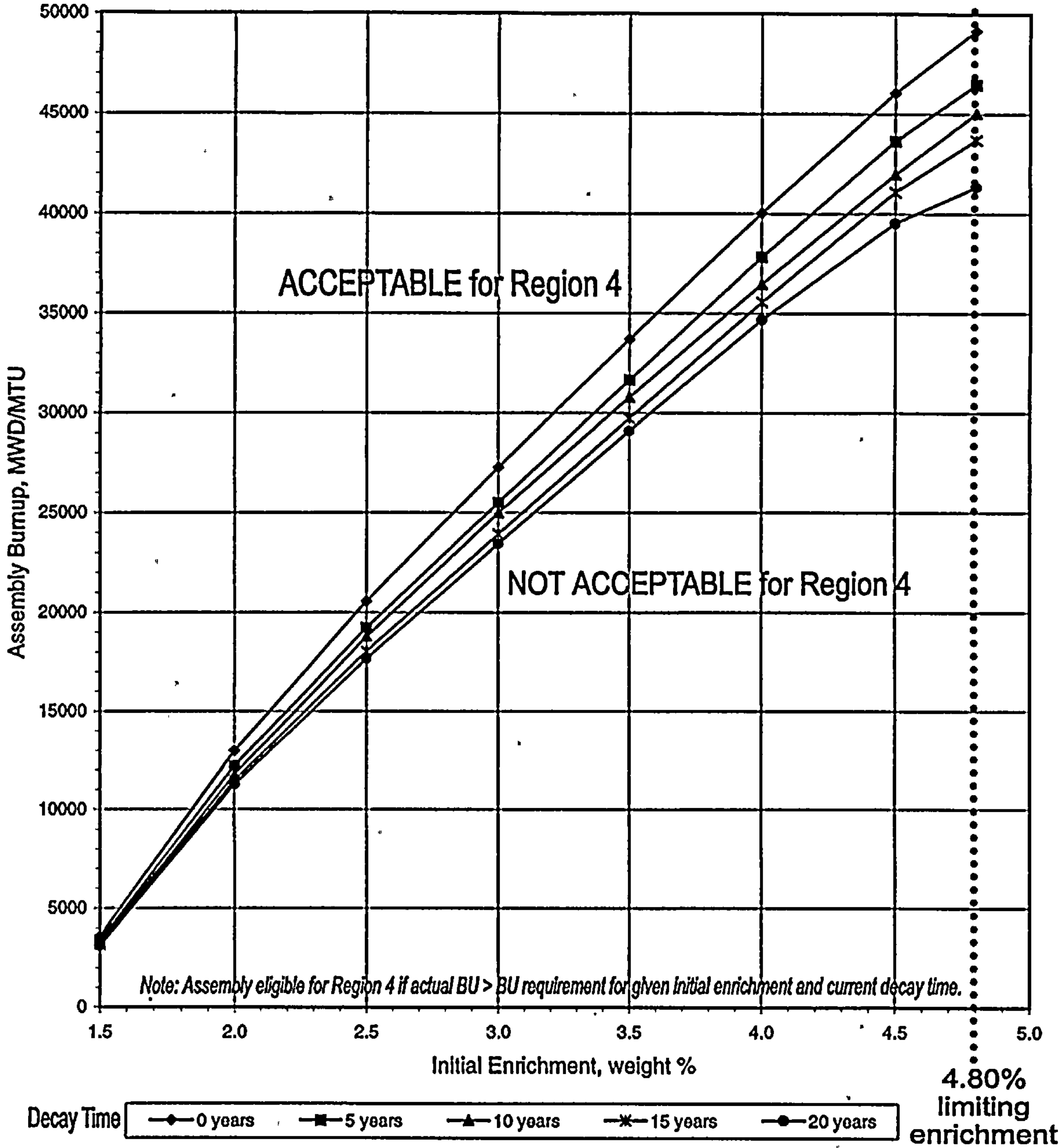


Figure 3.7.17-3
ASSEMBLY BURNUP VERSUS INITIAL ENRICHMENT
for
Region 4
(at decay times from 0 to 20 years)



4.0 DESIGN FEATURES (continued)

4.3 Fuel Storage

4.3.1 Criticality

4.3.1.1 The spent fuel storage racks are designed and shall be maintained with:

a. Fuel assemblies having a maximum radially averaged U-235 enrichment of 4.80 weight percent;

b. $k_{eff} < 1.0$ if fully flooded with unborated water, which includes an allowance for biases and uncertainties as described in Section 9.1 of the UFSAR;

c. $k_{eff} \leq 0.95$ if fully flooded with water borated to 900 ppm, which includes an allowance for biases and uncertainties as described in Section 9.1 of the UFSAR.

d. A nominal 9.5 inch center-to-center distance between adjacent storage cell locations.

e. Region 1: Fuel shall be stored in a checkerboard (two-out-of-four) storage pattern. Fuel that qualifies to be stored in Regions 1, 2, 3, or 4 in accordance with Figures 3.7.17-1, 3.7.17-2, or 3.7.17-3, may be stored in Region 1.

f. Region 2: Fuel shall be stored in a repeating 3-by-4 storage pattern in which Region 2 (two-out-of-twelve) assemblies and Region 4 (ten-out-of-twelve) assemblies are mixed as shown in Section 9.1 of the UFSAR. Only fuel that qualifies to be stored in Regions 2, 3, or 4, in accordance with Figures 3.7.17-1, 3.7.17-2, or 3.7.17-3, may be stored in Region 2.

g. Region 3: Fuel shall be stored in a four-out-of-four storage pattern. Only fuel that qualifies to be stored in Regions 3 or 4, in accordance with Figures 3.7.17-2 or 3.7.17-3, may be stored in Region 3.

(continued)

4.0 DESIGN FEATURES (continued)

h. Region 4: Fuel shall be stored in a repeating 3-by-4 storage pattern in which Region 2 (two-out-of-twelve) assemblies and Region 4 (ten-out-of-twelve) assemblies are mixed as shown in Section 9.1 of the UFSAR. Only fuel that qualifies to be stored in Region 4 in accordance with Figure 3.7.17-3 shall be stored in Region 4.

4.3.1.2 The new fuel storage racks are designed and shall be maintained with:

a. Fuel assemblies having a maximum radially averaged U-235 enrichment of 4.80 weight percent;

b. $k_{eff} \leq 0.95$ if fully flooded with unborated water, which includes an allowance for biases and uncertainties as described in Section 9.1 of the UFSAR;

c. $k_{eff} \leq 0.98$ if moderated by aqueous foam, which includes an allowance for biases and uncertainties as described in Section 9.1 of the UFSAR; and

d. A nominal 17 inch center to center distance between fuel assemblies placed in the storage racks.

4.3.2 Drainage

The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 137 feet - 6 inches.

4.3.3 Capacity

The spent fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than 1329 fuel assemblies.

ENCLOSURE 2

Revised Technical Specifications Bases

B 3.7 PLANT SYSTEMS

B 3.7.15 Fuel Storage Pool Boron Concentration

BASES

BACKGROUND

As described in LCO 3.7.17, "Spent Fuel Assembly Storage," fuel assemblies are stored in the spent fuel racks in accordance with criteria based on initial enrichment and discharge burnup. Although the water in the spent fuel pool is normally borated to ≥ 2150 ppm, the criteria that limit the storage of a fuel assembly to specific rack locations is conservatively developed without taking credit for boron.

INSERT 1

APPLICABLE SAFETY ANALYSES

A fuel assembly could be inadvertently loaded into a spent fuel rack location not allowed by LCO 3.7.17 (e.g., an unirradiated fuel assembly or an insufficiently depleted fuel assembly). Another type of postulated accident is associated with a fuel assembly that is dropped onto the fully loaded fuel pool storage rack or between a rack and the pool walls. These incidents could have a positive reactivity effect, decreasing the margin to criticality. However, the negative reactivity effect of the soluble boron compensates for the increased reactivity caused by these postulated accident scenarios.

The concentration of dissolved boron in the fuel pool satisfies Criterion 2 of 10 CFR 50.36 (c)(2)(ii).

LCO

The specified concentration of dissolved boron in the fuel pool preserves the assumptions used in the analyses of the potential accident scenario described above. This concentration of dissolved boron is the minimum required concentration for fuel assembly storage and movement within the fuel pool.

S

APPLICABILITY

This LCO applies whenever fuel assemblies are stored in the spent fuel pool until a complete spent fuel pool verification has been performed following the last movement of fuel assemblies in the spent fuel pool. This LCO does not apply following the verification since the verification would confirm that there are no misloaded fuel assemblies.

INSERT 2

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Technical Specification Bases 3.7.15

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In order to maintain the spent fuel pool $k_{eff}<1.0$, a soluble boron concentration of 900 ppm is required to maintain the spent fuel pool $k_{eff} \leq 0.95$ assuming the most limiting single fuel mishandling accident.

Insert 2

in order to comply with the TS 4.3.1.1.c design requirement that $k_{eff} \leq 0.95$.

BASES

APPLICABILITY (continued)

With no further fuel assembly movements in progress, there is no potential for a misloaded fuel assembly or a dropped fuel assembly.

ACTIONS

A.1 (A.2.1) and A.2 (2)

The Required Actions are modified by a Note indicating that LCO 3.0.3 does not apply.

When the concentration of boron in the spent fuel pool is less than required, immediate action must be taken to preclude an accident from happening or to mitigate the consequences of an accident in progress. This is most efficiently achieved by immediately suspending the movement of fuel assemblies. This does not preclude the movement of fuel assemblies to a safe position. In addition, action must be immediately initiated to restore boron concentration to within limit. Alternately, immediate action to perform a fuel storage pool verification can be initiated.

If moving fuel assemblies while in MODE 5 or 6, LCO 3.0.3 would not specify any action. If moving fuel assemblies while in MODE 1, 2, 3, or 4, the fuel movement is independent of reactor operation. Therefore, inability to suspend movement of fuel assemblies is not sufficient reason to require a reactor shutdown.

SURVEILLANCE REQUIREMENTS

SR 3.7.15.1

This SR verifies that the concentration of boron in the spent fuel pool is within the required limit. As long as this SR is met, the analyzed incidents are fully addressed. The 7 day Frequency is appropriate because no major replenishment of pool water is expected to take place over a short period of time.

REFERENCES

1. UFSAR, Section 9.12 ← 1.2

2. PVNGS Operating License Amendments 82, 69 and 54 for Units 1, 2 and 3, respectively, and associated NRC Safety Evaluation dated September 30, 1994.

INSERT 1 →

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Technical Specification Bases 3.7.15

<u>Insert 1</u>

3. 13-N-001-1900-1221-1, "Palo Verde Spent Fuel Pool Criticality Analysis," ABB calculation A-PV-FE-0106, revision 3, dated January 15, 1999.

B 3.7 PLANT SYSTEMS

B 3.7.17 Spent Fuel Assembly Storage

BASES

BACKGROUND

The spent fuel storage is designed to store either new (nonirradiated) nuclear fuel assemblies, or burned (irradiated) fuel assemblies in a vertical configuration underwater. The storage pool was originally designed to store up to 1329 fuel assemblies in a borated fuel storage mode. The current storage configuration, which allows credit to be taken for burnup and does not require neutron absorbing (boraflex) storage cans, provides for a maximum storage of 1054 fuel assemblies in a three-region configuration. Region 1 is comprised of three 9x8 storage racks, one 12x8 storage rack and one 9x9 storage rack. To prevent inadvertent storage of a fuel assembly in a cell required to be vacant, cell blocking devices are placed in every other storage cell location to maintain a two-out-of-four checkerboard configuration. Region 2 is comprised of three 9x8 storage racks and one 12x8 storage rack. Cell blocking devices in Region 2 are employed in one out of every four storage cell locations to preclude the possibility of an unanalyzed assembly configuration. Region 3 is comprised of six 9x8 storage racks and two 12x8 storage racks. Since fuel assemblies may be stored in every Region 3 cell location, no cell blocking devices are installed in Region 3. Cell blocking devices are also placed along the Region 2 interface with Region 3 to eliminate the possibility of an unanalyzed arrangement of assemblies. The spent fuel storage cells are installed in parallel rows with a nominal center-to-center spacing of 9.5 inches. This spacing and the storage of fuel in the appropriate region based on assembly burnup in accordance with TS Figure 3.7.17-1, is sufficient to maintain a k_{eff} of $\leq$0.95 for spent fuel of original enrichment of up to 4.30%.

APPLICABLE SAFETY ANALYSES

The spent fuel storage pool is designed for non-criticality by use of adequate spacing, and the storage of fuel in the appropriate region based on assembly burnup in accordance with TS Figure 3.7.17-1.

(continued)

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Technical Specification Bases 3.7.17

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The design basis of the spent fuel cooling system, however, is to provide adequate cooling to the spent fuel during all operating conditions (including full core offload) for only 1205 fuel assemblies (UFSAR section 9.1.3). Therefore, an additional four spaces are mechanically blocked to limit the maximum number of fuel assemblies that may be stored in the spent fuel storage pool to 1205.

Insert 2

Since fuel assemblies may be stored in every Region 3 cell location, no cell blocking devices are installed in Region 3.

Regions 2 and 4 are mixed and are comprised of seven 9x8 storage racks and three 12x8 storage racks. Regions 2 and 4 are mixed in a repeating 3x4 storage pattern in which two-out-of-twelve cell locations are designated Region 2 and ten-out-of-twelve cell locations are designated Region 4 (see UFSAR Figure 9.1-9). Since fuel assemblies may be stored in every Region 2 and Region 4 cell location, no cell blocking devices are installed in Region 2 and Region 4.

Insert 3

, 3.7.17-2, and 3.7.17-3. The design requirements related to criticality (TS 4.3.1.1) are $k_{eff}<1.0$ assuming no credit for boron and $k_{eff} \leq 0.95$ taking credit for soluble boron. The burnup versus enrichment requirements (TS Figures 3.7.17-1, 3.7.17-2, and 3.7.17-3) are developed assuming $k_{eff}<1.0$ with no credit taken for soluble boron, and that $k_{eff} \leq 0.95$ assuming a soluble boron concentration of 900 ppm and the most limiting single fuel mishandling accident.

BASES

APPLICABLE SAFETY ANALYSIS (continued)

The analysis of the reactivity effects of fuel storage in the spent fuel storage racks was performed by ABB-Combustion Engineering (CE) using the two-dimensional discrete ordinates transport theory DOT-IV computer code with four energy group neutron cross sections generated by the CEPAK code. These codes have been previously used by CE for the analysis of fuel rack reactivity and have been benchmarked against results from numerous critical experiments. These experiments simulate the PVNGS fuel storage racks as realistically as possible with respect to parameters important to reactivity such as enrichment and assembly spacing. In March 1992, the NRC issued Information Notice 92-21 and Supplement 1 concerning discrepancies that were discovered in spent fuel pool reactivity calculations. The discrepancies were due to an overestimation of neutron absorption in the CEPAK generation of cross sections. These discrepancies were found to exist only in regions containing a strong neutron absorber (poison). Since neutron poison is not present, this problem does not exist for the PVNGS racks.

INSERT 1

The modeling of Regions 2, and 3 ,and 4 included several conservative assumptions. These assumptions neglected the reactivity effects of axial leakage, poison shims in the assemblies, and structural grids and soluble boron in the 68°F pool water. These assumptions tend to increase the calculated effective multiplication factor (k_{eff}) of the racks. The stored fuel assemblies were modeled as CE 16x16 assemblies with a nominal pitch of 0.506 0.5065 inches between fuel rods, a fuel pellet diameter of 0.33 0.3255 inches, and a UO(2) density of 10.4 10.31 g/cc.

DOT-IV calculations were used to construct a curve of burnup versus initial enrichment for both Regions 2 and 3 (TS Figure 5.6-1) such that all points on the curve produce a k_{eff} value (without uncertainties or biases) of 0.93. This method of reactivity equivalencing has been accepted by the NRC and used for numerous other spent fuel storage pools which take credit for burnup. The NRC criticality acceptance criterion for fuel storage is that k_{eff} be no greater than 0.95, including all uncertainties at a 95% probability/95% confidence level. Therefore, the reactivity of assemblies, minimum monolith thickness, temperature variations, minimum L-insert thickness, assembly enrichment, and assembly burnup were obtained as well as a methodology uncertainty and bias. These were applied to the nominal value of 0.93 to obtain a final k_{eff} 0.944 for the spent fuel racks. This meets the NRC criterion of no greater than 0.95.

INSERT 2

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Technical Specification Bases 3.7.17

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three dimensional Monte Carlo code KENO-VA with the updated 44 group ENDF/B-5 neutron cross section library. The KENO code has

Insert 2

KENO-Va calculations were used to construct curves of burnup versus initial enrichment for decay times in 5 year increments from 0 to 20 years for both Regions 3 and 4 (TS Figures 3.7.17-2 and 3.7.17-3) such that all points on the curves produce a k_{eff} value (including all biases and uncertainties) of <1.0 for unborated water. Biases associated with methodology and water temperature were included, and uncertainties associated with methodology, KENO-Va calculation, fuel enrichment, fuel rack pitch, fuel rack and L-insert thickness, pellet stack density, and asymmetric fuel assembly loading were included. KENO-Va calculations were also performed to determine the soluble boron concentration required to maintain the spent fuel pool k_{eff} (including all biases and uncertainties) ≤ 0.95 at a 95% probability/95% confidence level. A soluble boron concentration of 900 ppm is required to assure that the spent fuel pool k_{eff} remains ≤0.95 at all times. This soluble boron concentration accounts for the positive reactivity effects of the most limiting single fuel mishandling event and uncertainties associated with fuel assembly reactivity and burnup. This method of reactivity equivalencing has been accepted by the NRC (Reference 3) and used for numerous other spent fuel storage pools that take credit for burnup, decay time, and soluble boron.

BASES

APPLICABLE SAFETY ANALYSES (continued)

Most abnormal storage conditions will not result in an increase in the k_{eff} of the racks. However, it is possible to postulate events, such as an assembly drop on top of a rack or between a rack and the pool walls or the misloading of an assembly, with a burnup and enrichment combination outside of the acceptable area in TS Figure 3.7.17-1, which could lead to an increase in reactivity. However, for such events, credit may be taken for the presence of 2150 ppm of boron in the pool water required by TS 3.7.15 since the staff does not require the assumption of two unlikely, independent, concurrent events to ensure protection against a criticality accident (double contingency principle). The reduction in k_{eff} caused by the boron more offsets the reactivity addition caused by credible accidents. Therefore, the staff criterion of k_{eff} no greater than 0.95 for any postulated accident is met.

INSERT 1

The criticality aspects of the spent fuel pool meet the requirements of General Design Criterion 62 for the prevention of criticality in fuel storage and handling.

The spent fuel pool head load calculations were based on a full pool with 1300 (1205) fuel assemblies. The maximum number of fuel assemblies that can be stored in the three-region configuration is 1054 fuel assemblies. The actual loading pattern therefore has a lower decay heat than assumed in the calculations for a full pool.

INSERT 2

The original licensing basis for the spent fuel pool allowed for spent fuel to be loaded in either a 4x4 array or a checkerboard array, depending on the use of boraflex poison (borated poison). Therefore, a fuel handling accident was assumed to occur with maximum loading of the pool. The fuel pool rack construction precludes more than one assembly from being impacted in a fuel handling accident. Therefore, the UFSAR analysis conclusion regarding the worst scenario for a dropped assembly (in which the horizontal impact of a fuel assembly on top of the spent fuel assembly damages fuel rods in the dropped assembly but does not impact fuel in the stored assemblies) continued (s) to be limiting.

The spent fuel assembly storage satisfies Criterion 2 of 10 CFR 50.36 (c)(2)(ii).

(continued)

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Technical Specification Bases 3.7.17

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with a burnup and enrichment combination outside of the acceptable area in TS Figure 3.7.17-1, or with a burnup, decay time, and enrichment combination outside of the acceptable area in TS Figures 3.7.17-2 or 3.7.17-3, which could lead to an increase in reactivity. These events would include an assembly drop on top of a rack or between a rack and the pool walls, or the misloading of an assembly. For such events, partial credit may be taken for the soluble boron in the spent fuel pool water to ensure protection against a criticality accident since the staff does not require the assumption of two unlikely, independent, concurrent events (double contingency principle). Although a soluble boron concentration of only 900 ppm is required to assure that k_{eff} remains ≤ 0.95 assuming the single most limiting fuel mishandling event, TS 3.7.15 conservatively requires the presence of 2150 ppm of soluble boron in the spent fuel pool water. As such, the reduction in k_{eff} caused by the required soluble boron concentration more than offsets the reactivity addition caused by credible accidents, and the staff criterion of $k_{eff} \leq 0.95$ is met at all times.

Insert 2

From the spent fuel pool criticality analysis, the number of fuel assemblies that can be stored in the four-region configuration is 1209 fuel assemblies. The design basis of the spent fuel cooling system, however, is to provide adequate cooling to the spent fuel during all operating conditions (including full core offload) for only 1205 fuel assemblies (UFSAR section 9.1.3). Therefore, an additional four spaces are mechanically blocked to limit the maximum number of fuel assemblies that may be stored in the spent fuel storage pool to 1205.

BASES

,3.7.17-2, and 3.7.17-3

LCO

The restrictions on the placement of fuel (S) assemblies within the spent fuel pool, according to Figure 3.7.17-1, in the accompanying LCO, ensures that the k_{eff} of the spent fuel pool will always remain ≤ 0.95 (<1.0) assuming the pool to be flooded with unborated water. The restrictions are consistent with the criticality safety analysis performed for the spent fuel pool according to Figure (S) 3.7.17-1, in the accompanying LCO. Specification 4.3.1.1 provides additional details for fuel storage in each of the three (four) Regions.

APPLICABILITY

This LCO applies whenever any fuel assembly is stored in the spent fuel pool.

ACTIONS

A.1

Required Action A.1 is modified by a Note indicating that LCO 3.0.3 does not apply.

When the configuration of fuel assemblies (S) stored in the spent fuel pool is not in accordance with Figure 3.7.17-1 (,3.7.17-2, and 3.7.17-3), immediate action must be taken to make the necessary fuel assembly movement(s) to bring the configuration into compliance with Figure (S) 3.7.17-1.

If moving irradiated fuel assemblies while in MODE 5 or 6, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, 3, or 4, the fuel movement is independent of reactor operation. Therefore, in either case, inability to move fuel assemblies is not sufficient reason to require a reactor shutdown.

SURVEILLANCE REQUIREMENTS

SR 3.7.17.1

This SR verifies by administrative means that the initial enrichment and burnup of the fuel assembly is in accordance with Figure (S) 3.7.17-1 (,3.17-2, and 3.17-3) in the accompanying LCO and Specification 4.3.1.1.

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Technical Specification Bases 3.7.17

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To manually determine the allowed SFP region for a fuel assembly, the actual burnup is compared to the burnup requirement for the given initial enrichment and appropriate decay time from Figure 3.7.17-1, 3.7.17-2, or 3.7.17-3. If the actual burnup is greater than or equal to the burnup requirement, then the fuel assembly is eligible to be stored in the corresponding region. If the actual burnup is less than the burnup requirement, then the comparison needs to be repeated using another curve for a lower numbered region. Note the following:

- that a fuel assembly that does not meet the burnup requirement for Region 2 must be stored in Region 1,
- that any fuel assembly may be stored in Region 1,
- that any fuel assembly may be stored in a lower numbered region than the region for which it qualifies because burnup requirements decrease as region numbers decrease (refer also to Tech Spec 4.3.1.1),
- and that comparing actual burnup to the burnup requirement for zero decay time will always be correct or conservative.

BASES

REFERENCES

1. UFSAR, Sections 9.1.2 (and 9.1.3)

2. PVNGS Operating License Amendments 82, 69, and 54 for Units 1, 2, and 3 respectively, and associated NRC Safety Evaluation, dated September 30, 1994.

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Technical Specification Bases 3.7.17

Insert 1

3. Letter from T. E. Collins, U.S. NRC to T. Greene. WOG, "Acceptance for Referencing of Licensing Topical Report WCAP-14416-P, Westinghouse Spent Fuel Rack Methodology (TAC NO. M93254)", October 25, 1996.

4. 13-N-001-1900-1221-1, "Palo Verde Spent Fuel Pool Criticality Analysis," ABB calculation A-PV-FE-0106, revision 03, dated January 15, 1999.

ENCLOSURE 3

Palo Verde Spent Fuel Pool Criticality Analysis (CENPD-395)