UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

NORTHERN STATES POWER COMPANY

DOCKET NO. 50-282

PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 129
License No. DPR-42

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

   A. The application for amendment by Northern States Power Company (the licensee) dated July 28, 1995, as revised February 21, 1997, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

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

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

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

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

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. DPR-42 is hereby amended to read as follows:

Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 129 , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of issuance, with full implementation within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION

Beth A. Wetzel

Beth A. Wetzel, Project Manager
Project Directorate III-1
Division of Reactor Projects - III/IV
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: June 12, 1997

ATTACHMENT TO LICENSE AMENDMENT NO. 129

FACILITY OPERATING LICENSE NO. DPR-42

DOCKET NO. 50-282

Revise Appendix A Technical Specifications by removing the pages identified below and inserting the attached pages. The revised pages are identified by amendment number and contain vertical lines indicating the area of change.

REMOVE	INSERT
TS-vi	TS-vi
TS-xi	TS-xi
TS-xiii	TS-xiii
TS.3.8-4	TS.3.8-4
TS.3.8-5	--
Figure TS.3.8-1	Figure TS.3.8-1
--	Figure TS.3.8-2
Table TS.4.1-2B (Page 1 of 2)	Table TS.4.1-2B (Page 1 of 2)
Table TS.4.1-2B (Page 2 of 2)	Table TS.4.1-2B (Page 2 of 2)
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TS.5.6-1	TS.5.6-1
TS.5.6-3	TS.5.6-3
Figure TS.5.6-1	Figure TS.5.6-1
Figure TS.5.6-2	Figure TS.5.6-2
--	Figure TS.5.6-3
--	Figure TS.5.6-4
--	Figure TS.5.6-5
--	Figure TS.5.6-6
--	Figure TS.5.6-7
--	Figure TS.5.6-8
--	Figure TS.5.6-9
--	Figure TS.5.6-10
--	Figure TS.5.6-11
--	Figure TS.5.6-12
B.3.8-2	B.3.8-2
B.3.8-3	B.3.8-3
B.3.8-4	B.3.8-4
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--	B.4.20-1

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	C. Inspection Frequencies	TS.4.12-3
	D. Acceptance Criteria	TS.4.12-4
	E. Reports	TS.4.12-5
4.13	Snubbers	TS.4.13-1
4.14	Control Room Air Treatment System Tests	TS.4.14-1
4.15	Spent Fuel Pool Special Ventilation System	TS.4.15-1
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4.17	Deleted	
4.18	Reactor Coolant Vent System Paths	TS.4.18-1
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	4.10	Deleted	
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	4.16	Deleted	
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APPENDIX A TECHNICAL SPECIFICATIONS

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3.8-1	Spent Fuel Pool Unrestricted Region Burnup and Decay Time Requirements - OFA Fuel
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5.6-12	Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - STD Fuel, 16 or More GAD
B.2.1-1	Origin of Safety Limit Curves at 2235 psig with delta-T Trips and Locus of Reactor Conditions at which SG Safety Valves Open

3.8.C. <u>Small Spent Fuel Pool Restrictions</u>

No more than 45 recently discharged assemblies shall be located in the small pool (pool No. 1).

D. <u>Spent Fuel Pool Special Ventilation System</u>

1. Both trains of the Spent Fuel Pool Special Ventilation System shall be OPERABLE at all times (except as specified in 3.8.D.2 and 3.8.D.3 below).

2. With one train of the Spent Fuel Pool Special Ventilation System inoperable, fuel handling operations and crane operations with loads over spent fuel (inside the spent fuel pool enclosure) are permissible during the following 7 days, provided the redundant train is demonstrated OPERABLE prior to proceeding with those operations.

3. With both trains of the Spent Fuel Pool Special Ventilation System inoperable, suspend all fuel handling operations and crane operations with loads over spent fuel (inside the spent fuel pool enclosure).

4. The provisions of specification 3.0.C are not applicable.

E. <u>Spent Fuel Pool Storage</u>

1. Fuel Assembly Storage

   a. The combination of initial enrichment, burnup and decay time of each spent fuel assembly stored in the spent fuel pool shall be within the unrestricted range of Figures TS.3.8-1 or TS.3.8-2, as applicable, or fuel assemblies shall be stored in accordance with Specification 5.6.A.1.e.

   b. If the requirements of 3.8.E.1.a are not met, immediately initiate action to move any noncomplying fuel assembly to an acceptable location.

   c. The provisions of Specification 3.0.C are not applicable.

2. Spent Fuel Pool Boron Concentration

   a. The spent fuel pool boron concentration shall be ≥ 1,800 ppm when fuel assemblies are stored in the spent fuel pool.

   b. If the spent fuel pool boron concentration is not within limit, then immediately:

      1. Suspend movement of fuel assemblies in the spent fuel pool, and

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

   c. The provisions of Specification 3.0.C are not applicable.

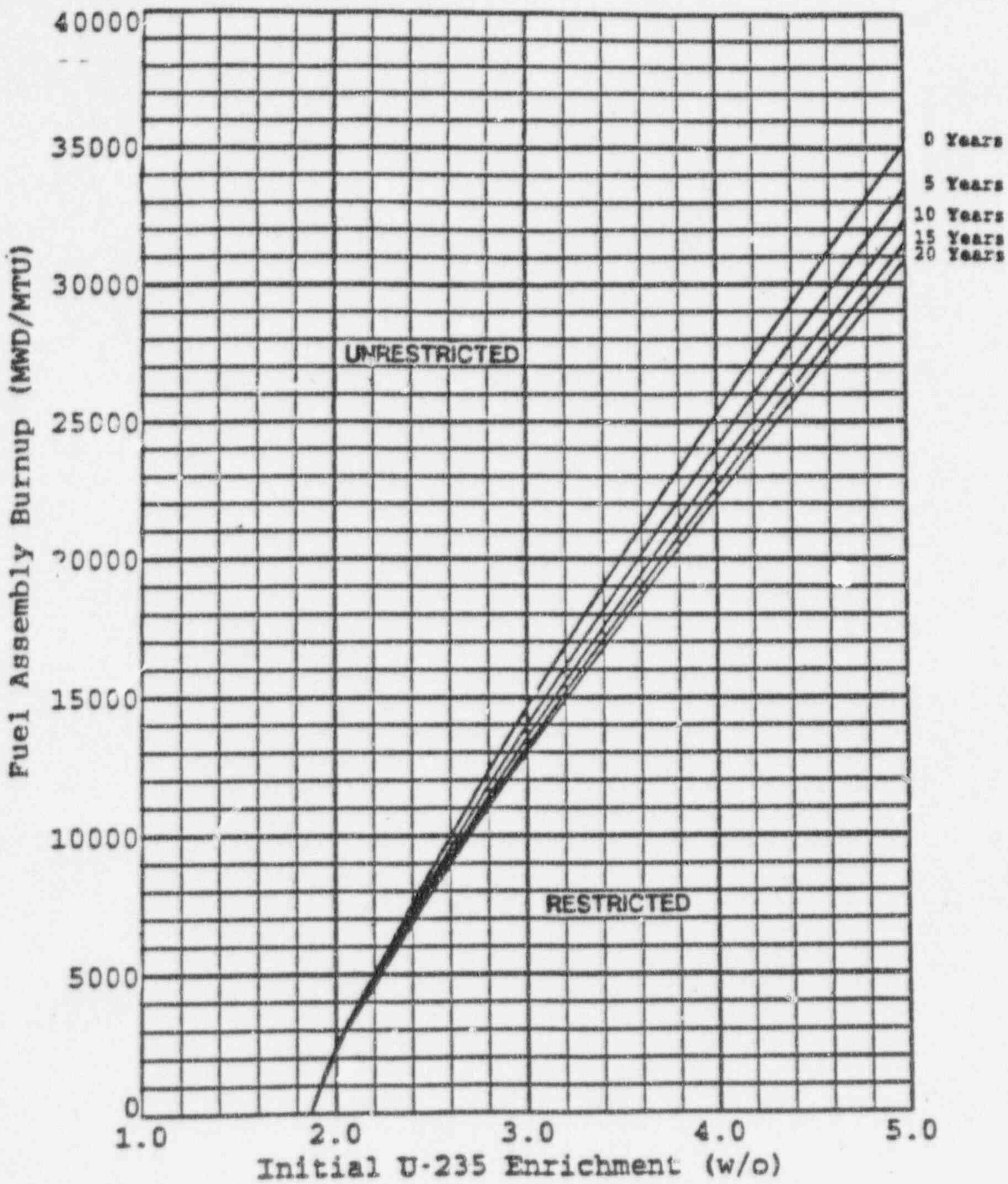


FIGURE TS.3.8-1 Spent Fuel Pool Unrestricted Region Burnup and Decay Time Requirements - OFA Fuel

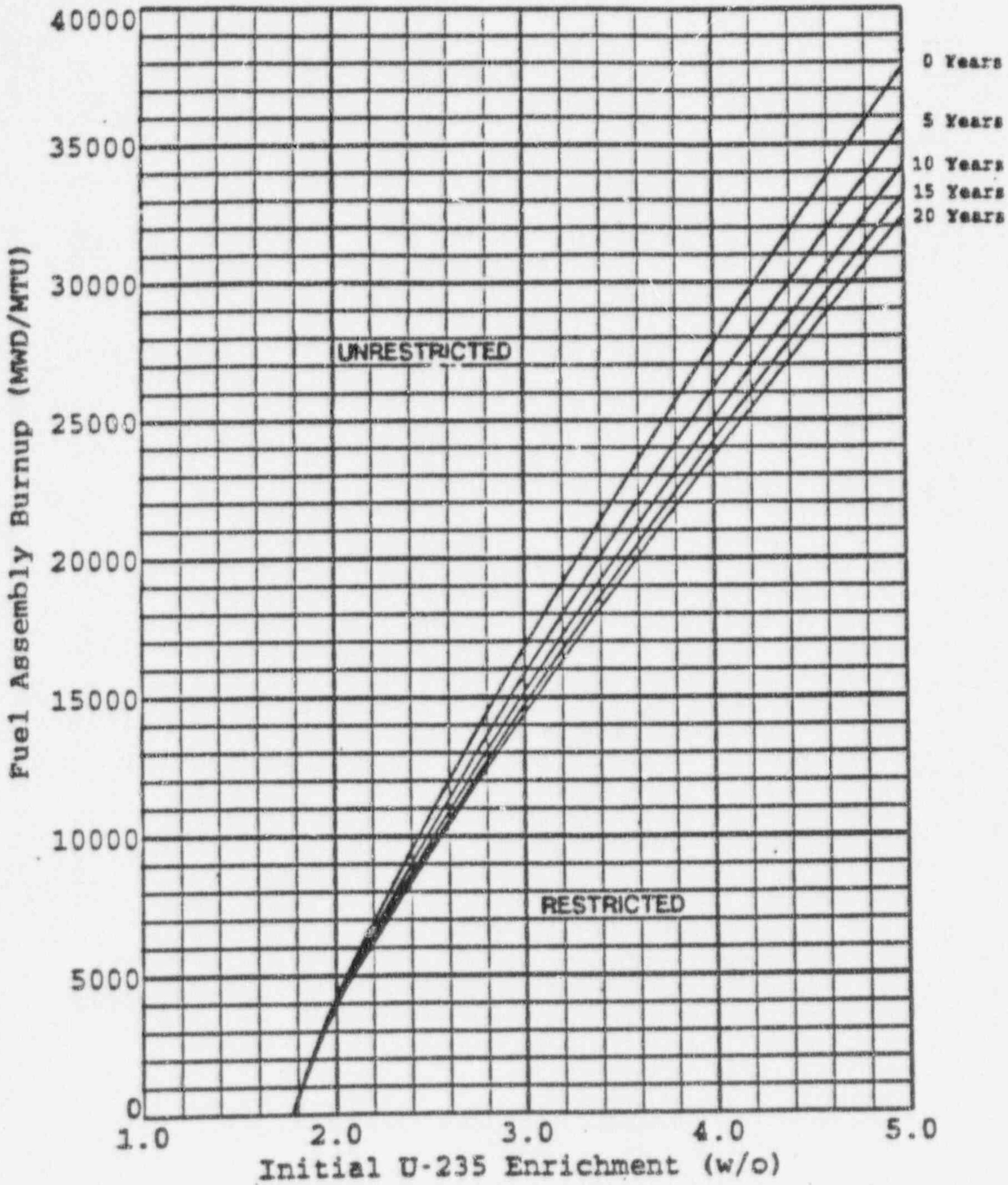


FIGURE TS.3.8-2 Spent Fuel Pool Unrestricted Region Burnup and Decay Time Requirements - STD Fuel

TABLE TS.4.1-2B

MINIMUM FREQUENCIES FOR SAMPLING TESTS

TEST	FREQUENCY
1. RCS Gross Activity Determination	5/week
2. RCS Isotopic Analysis for DOSE EQUIVALENT I-131 Concentration	1/14 days (when at power)
3. RCS Radiochemistry $\bar{E}$ determination	1/6 months(1) (when at power)
4. RCS Isotopic Analysis for Iodine Including I-131, I-133, and I-135	a) Once per 4 hours, whenever the specific activity exceeds 1.0 uCi/gram DOSE EQUIVALENT I-131 or 100/$\bar{E}$ uCi/gram (at or above cold shutdown), and b) One sample between 2 and 6 hours following THERMAL POWER change exceeding 15 percent of the RATED THERMAL POWER within a one hour period (above hot shutdown)
5. RCS Radiochemistry (2)	Monthly
6. RCS Tritium Activity	Weekly
7. RCS Chemistry (Cl^-, F^-, O_2)	5/Week
8. RCS Boron Concentration*(3)	2/Week (4)
9. RWST Boron Concentration	Weekly
10. Boric Acid Tanks Boron Concentration	2/Week
11. Caustic Standpipe NaOH Concentration	Monthly
12. Accumulator Boron Concentration	Monthly
13. Spent Fuel Pit Boron Concentration	Weekly

* Required at all times.

TABLE TS.4.1-2B

MINIMUM FREQUENCIES FOR SAMPLING TESTS

TEST	FREQUENCY
14. Secondary Coolant Gross Beta-Gamma activity	Weekly
15. Secondary Coolant Isotopic Analysis for DOSE EQUIVALENT I-131 concentration	1/6 months (5)
16. Secondary Coolant Chemistry	
pH	5/week (6)
pH Control Additive	5/week (6)
Sodium	5/week (6)

Notes:

1. Sample to be taken after a minimum of 2 EFPD and 20 days of POWER OPERATION have elapsed since reactor was last subcritical for 48 hours or longer.
2. To determine activity of corrosion products having a half-life greater than 30 minutes.
3. During REFUELING, the boron concentration shall be verified by chemical analysis daily.
4. The maximum interval between analyses shall not exceed 5 days.
5. If activity of the samples is greater than 10% of the limit in Specification 3.4.D, the frequency shall be once per month.
6. The maximum interval between analyses shall not exceed 3 days.

4.20 Spent Fuel Pool Storage Configuration

Applicability

This surveillance is applicable whenever fuel is stored in the spent fuel pool.

Objective

To verify that fuel assemblies in the spent fuel pool are stored in accordance with the requirements of Specification 3.8.E.1.a.

Specification

A spent fuel pool inventory verification shall be performed within 7 days of the completion of any fuel handling campaign which involves the relocation of fuel assemblies within the spent fuel pool or the addition of fuel assemblies to the spent fuel pool.

5.6 FUEL HANDLING

A. Criticality Consideration

1. The spent fuel storage racks are designed (Reference 1) and shall be maintained with:

   a. Fuel assemblies having a maximum U-235 enrichment of 5.0 weight percent;

   b. $K_{eff} < 1.0$ if fully flooded with unborated water, which includes an allowance for uncertainties as described in Reference 3;

   c. $K_{eff} \leq 0.95$ if fully flooded with water borated to 750 ppm, which includes an allowance for uncertainties as described in Reference 3;

   d. New or spent fuel assemblies with a combination of discharge burnup, initial enrichment and decay time in the unrestricted range of Figures TS.3.8-1 or TS.3.8-2, as applicable, may be allowed unrestricted storage in the spent fuel racks; and

   e. New or spent fuel assemblies with a combination of discharge burnup, initial enrichment and decay time in the restricted range of Figures TS.3.8-1 or TS.3.8-2, as applicable, will be stored in compliance with Figures TS.5.6-1 through TS.5.6-12.

2. The new fuel storage racks are designed (Reference 1) and shall be maintained with:

   a. Fuel assemblies having a maximum U-235 enrichment of 5.0 weight percent;

   b. $K_{eff} \leq 0.95$ if fully flooded with unborated water, which includes an allowance for uncertainties as described in Reference 2; and

   c. $K_{eff} \leq 0.98$ if accidentally filled with a low density moderator which resulted in optimum low density moderation conditions.

3. Fuel will not be inserted into a spent fuel cask in the pool, unless a minimum boron concentration of 1800 ppm is present. The 1800 ppm will ensure that k_{eff} for the spent fuel cask, including statistical uncertainties, will be less than or equal to 0.95 for all postulated arrangements of fuel within the cask. The criticality analysis for the TN-40 spent fuel storage cask was based on fresh fuel enriched to 3.85 weight percent U-235.

B. Spent Fuel Storage Structure

The spent fuel storage pool is enclosed with a reinforced concrete building having 12- to 18-inch thick walls and roof (Reference 1). The pool and pool enclosure are Class I (seismic) structures that afford protection against loss of integrity from postulated tornado missiles. The storage compartments and the fuel transfer canal are connected by fuel transfer slots that can be closed off with pneumatically sealed gates. The bottoms of the slots are above the tops of the active fuel in the fuel assemblies which will be stored vertically in specially constructed racks.

D. Spent Fuel Storage Capacity

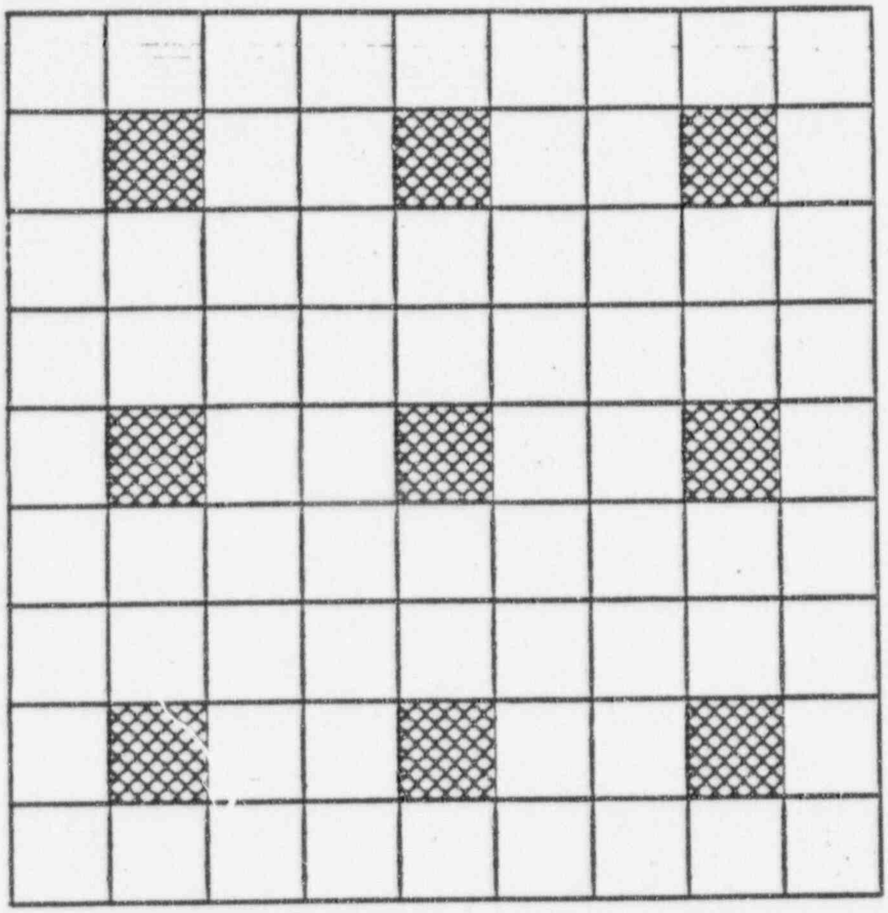
The spent fuel storage facility is a two-compartment pool that, if completely filled with fuel storage racks, provides up to 15[illegible] storage locations. The southeast corner of the small pool (pool n[illegible]) also serves as the cask lay down area. During times when the c[illegible]sk is being used, four racks are removed from the small pool. With the four storage racks in the southeast corner of pool 1 removed, a total of 1386 storage locations are provided. To allow insertion of a spent fuel cask, total storage is limited to 1386 assemblies, not including those assemblies which can be returned to the reactor.

Reference

1. USAR, Section 10.2

2. "Criticality Analysis of the Prairie Island Units 1 & 2 Fresh and Spent Fuel Racks", Westinghouse Commercial Nuclear Fuel Division, February 1993.

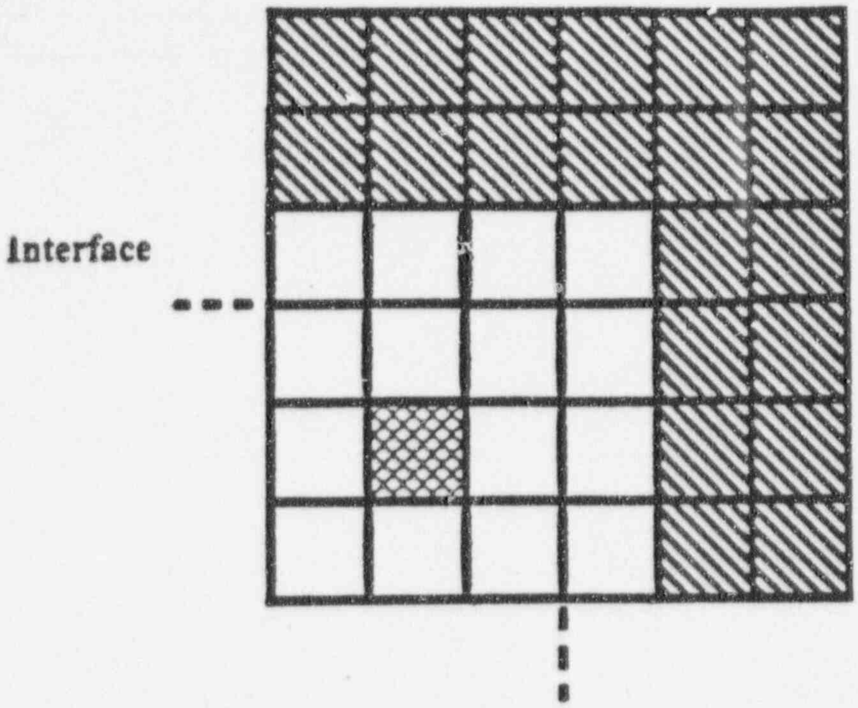
3. "Northern States Power Prairie Island Units 1 and 2 Spent Fuel Rack Criticality Analysis Using Soluble Boron Credit", Westinghouse Commercial Nuclear Fuel Division, February 1997.

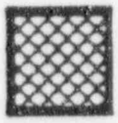


Fresh Fuel: Must be less than or equal to nominal 4.95 w/o ^{235}U
No restrictions on burnup

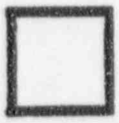
Burned Fuel: Must satisfy minimum burnup requirements of Figures TS.5.6-3 through TS.5.6-12 depending on number of GAD rods in fresh fuel

FIGURE TS.5.6-1 Spent Fuel Pool Burned/Fresh Checkerboard Cell Layout





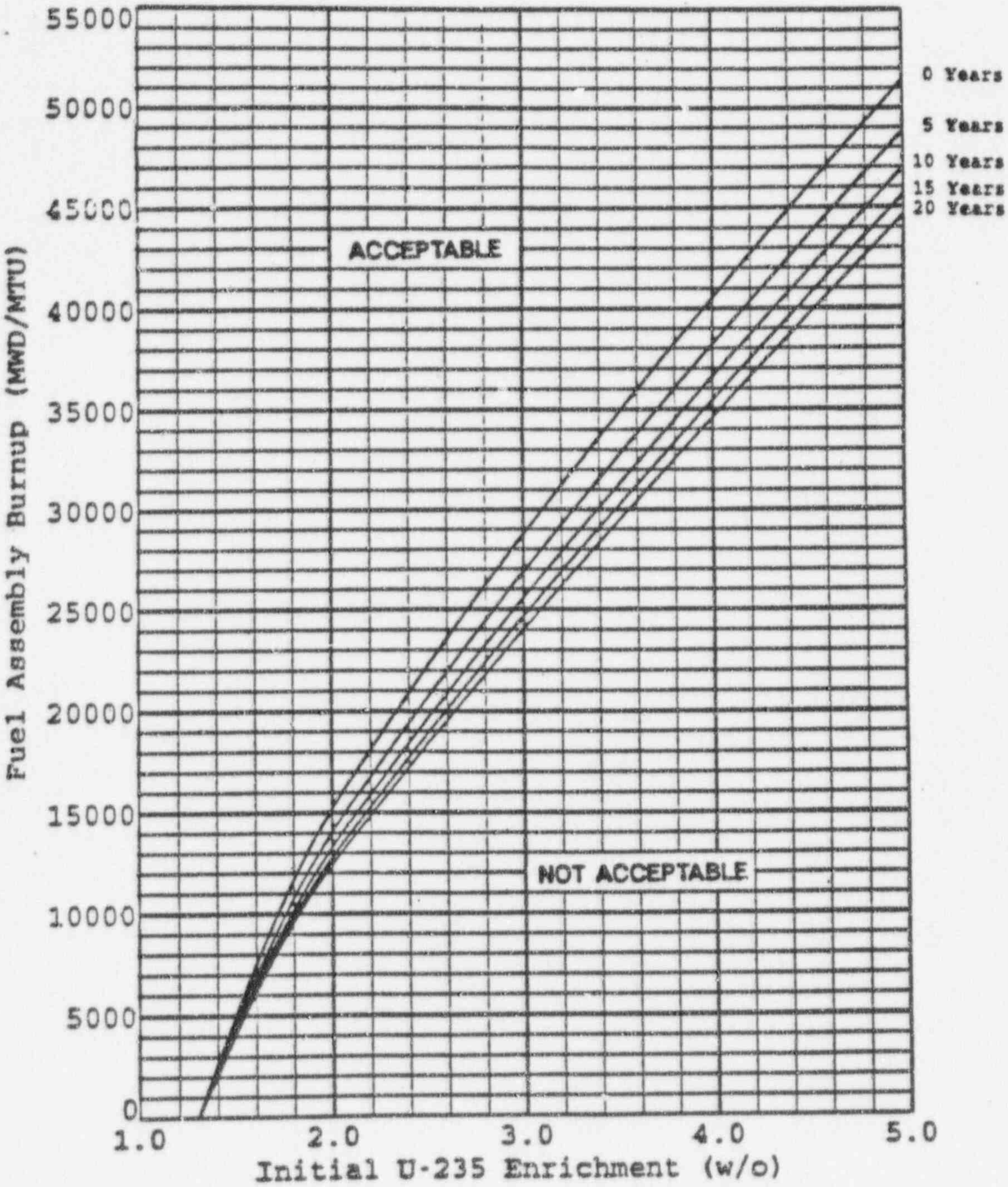
Fresh Fuel: Must be less than or equal to nominal 4.95 w/o ^{235}U
No restrictions on burnup



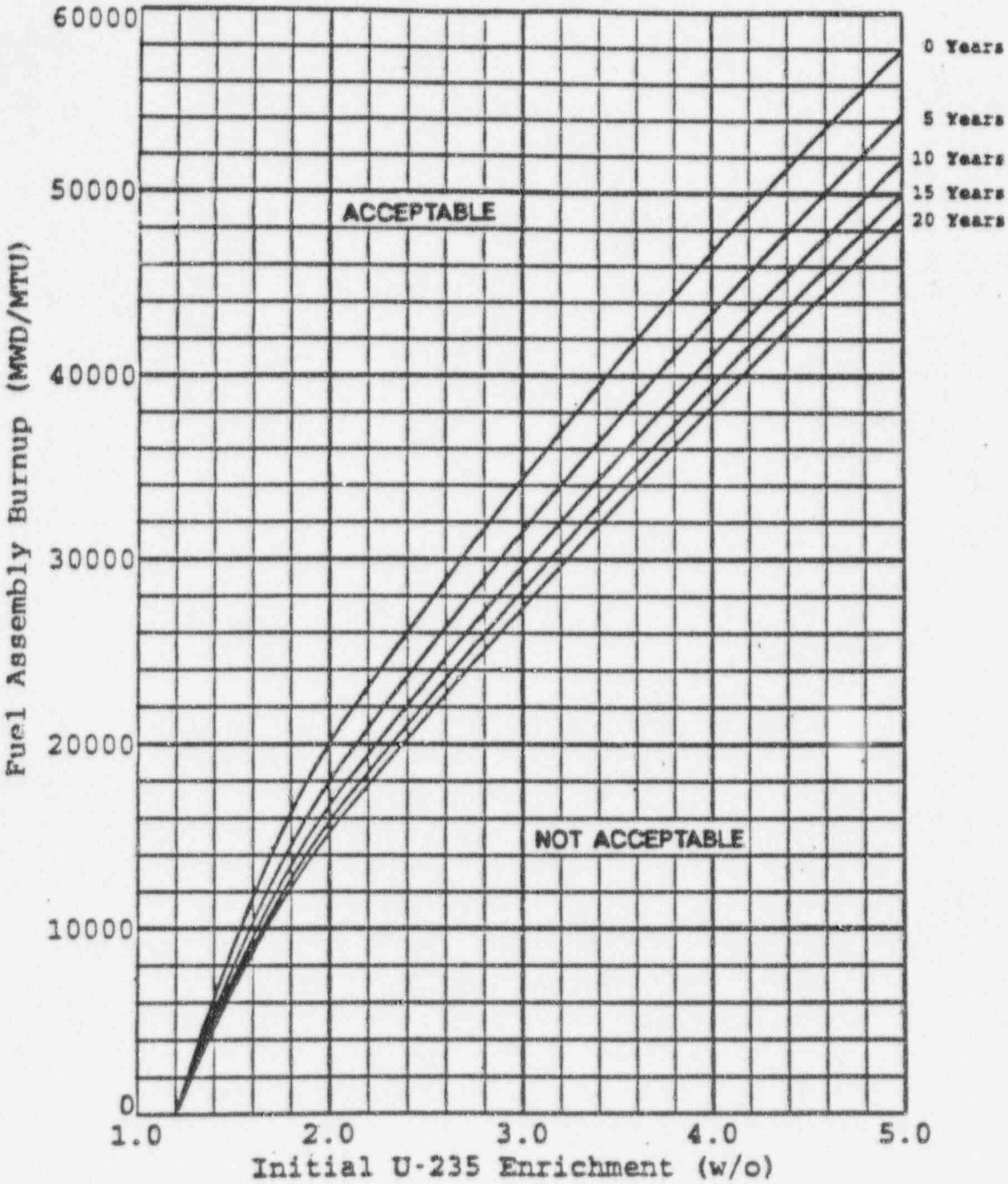
Burned Fuel: 3x3 Checkerboard Region
Must satisfy minimum burnup requirements of Figures TS.5.6-3 through TS.5.6-12

Burned Fuel: All Cell Unrestricted Region
Must satisfy minimum burnup requirements of Figures TS.3.8-1 or TS.3.8-2

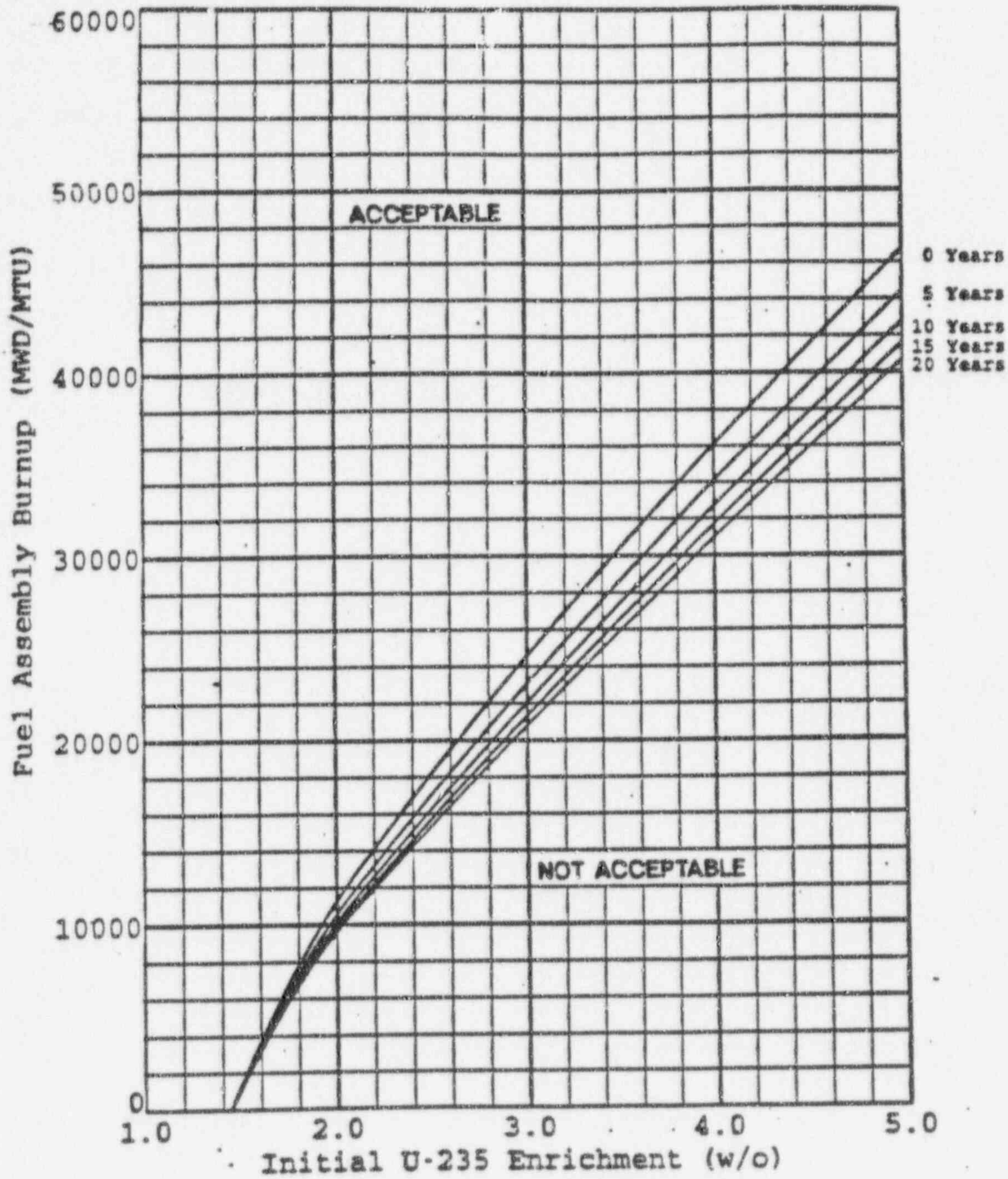
FIGURE TS.5.6-2 Spent Fuel Pool Checkerboard Interface Requirements



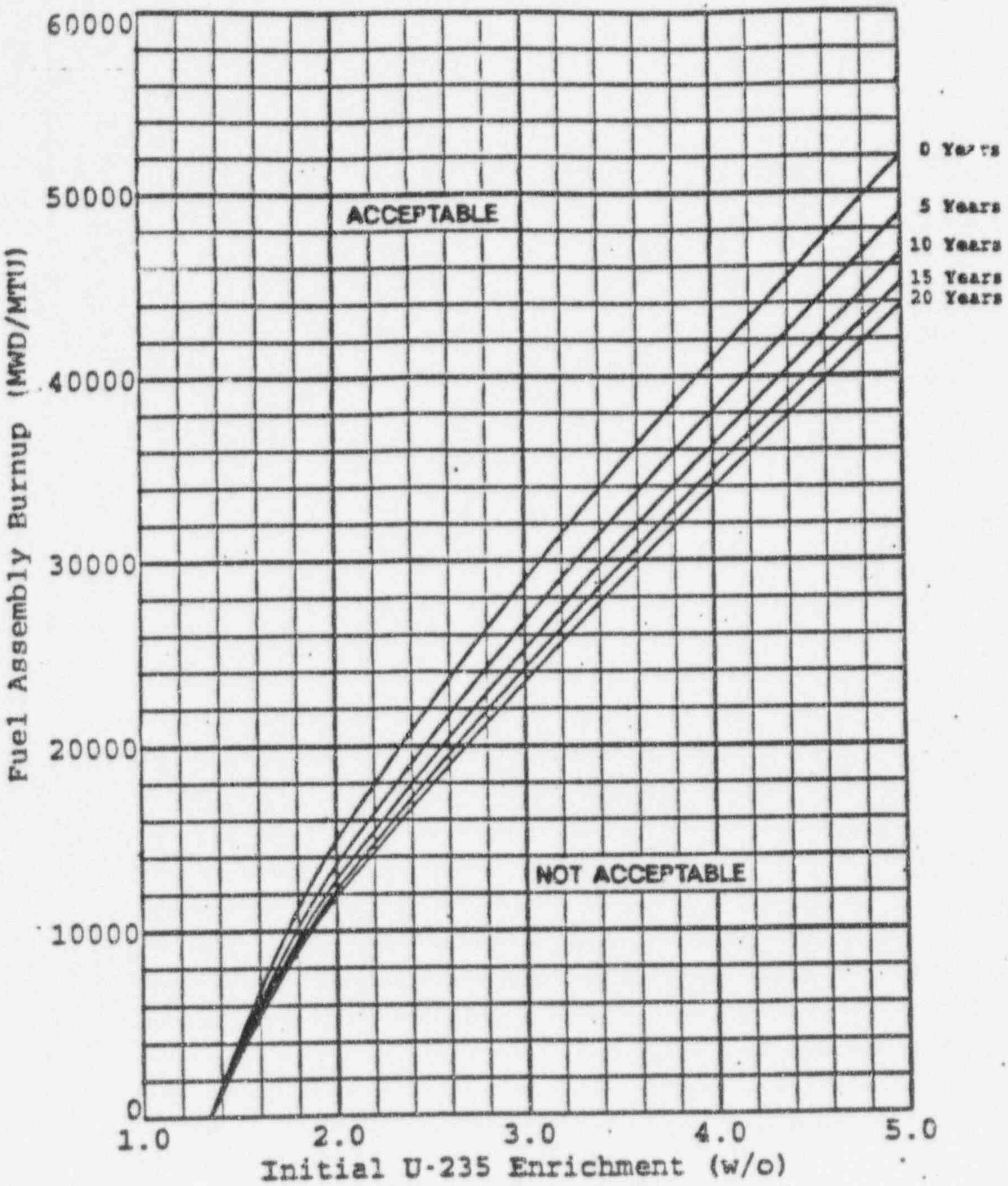
TS.5.6-3 Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - OEA Fuel, No GAD



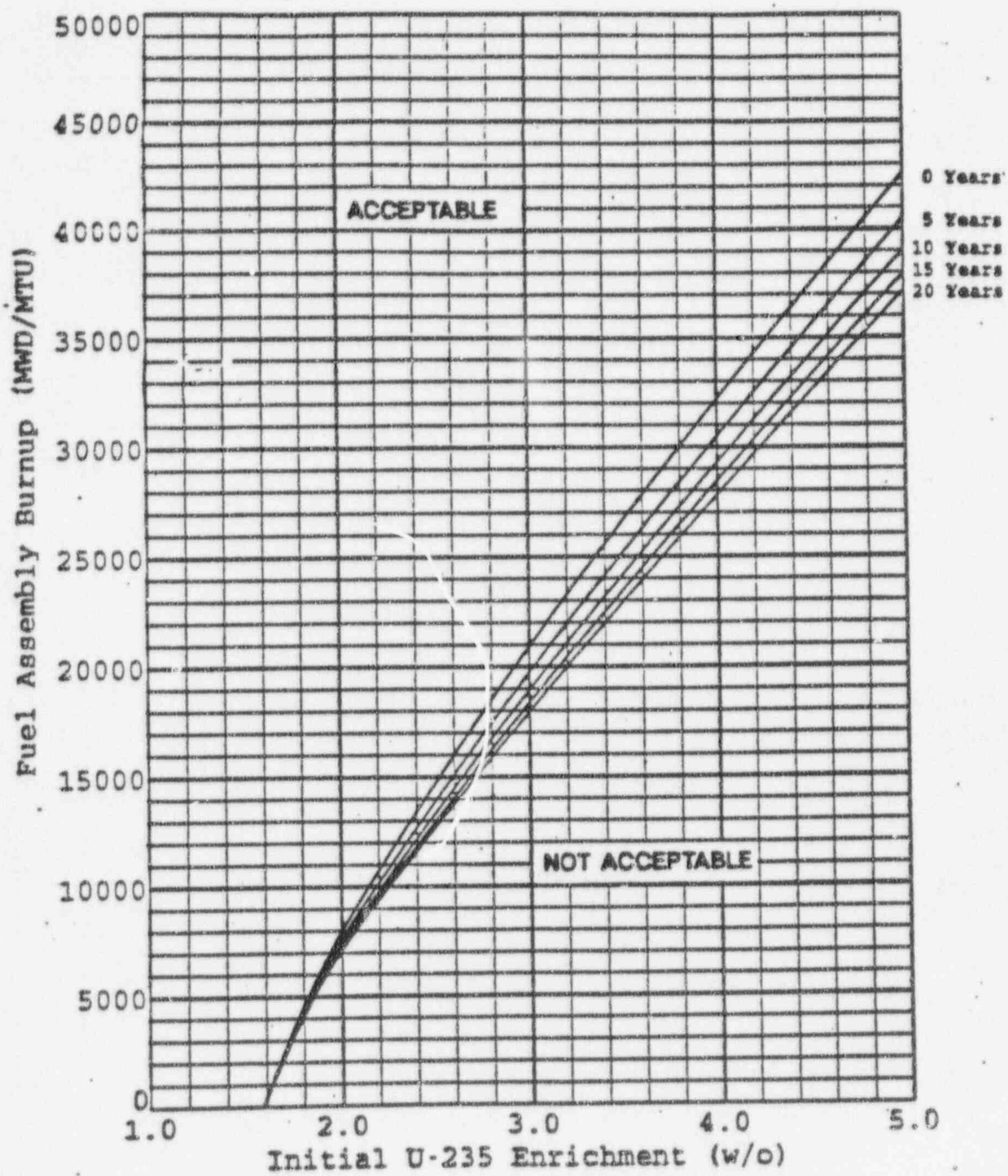
TS.5.6-4 Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - STD Fuel, No GAD



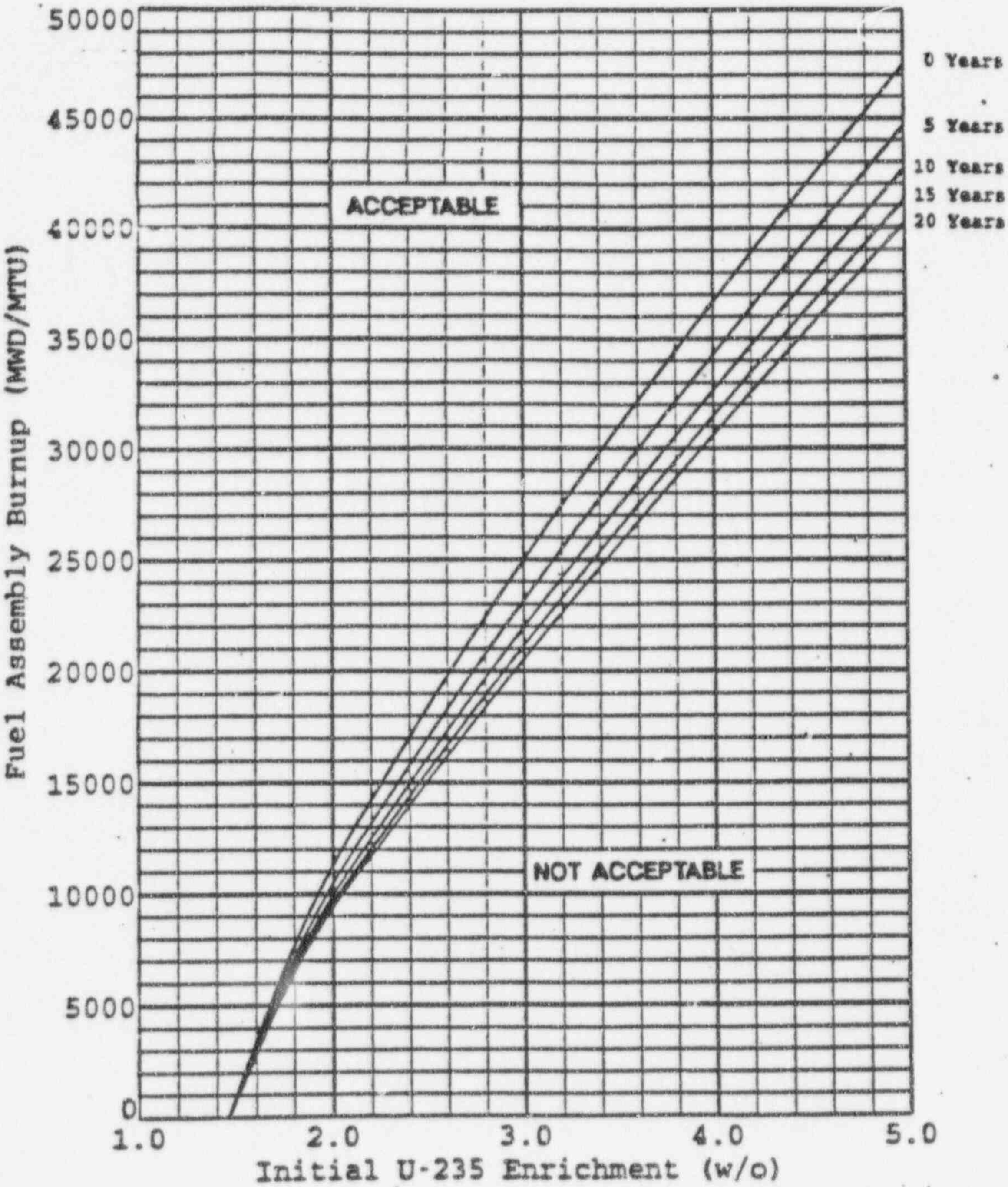
TS.5.6-5 Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - OFA Fuel, 4 GAD



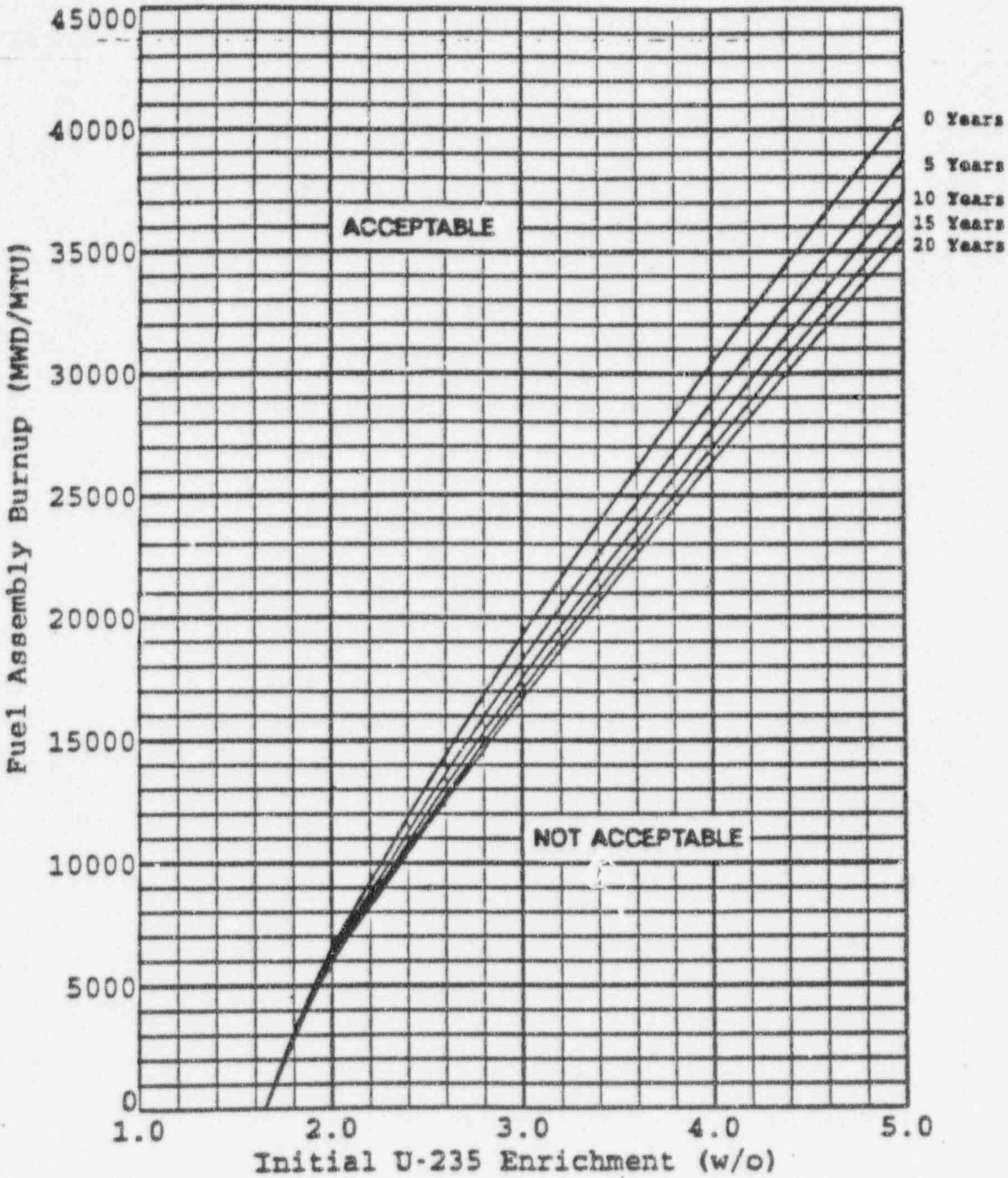
TS.5.6-6 Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - STD Fuel, 4 GAD



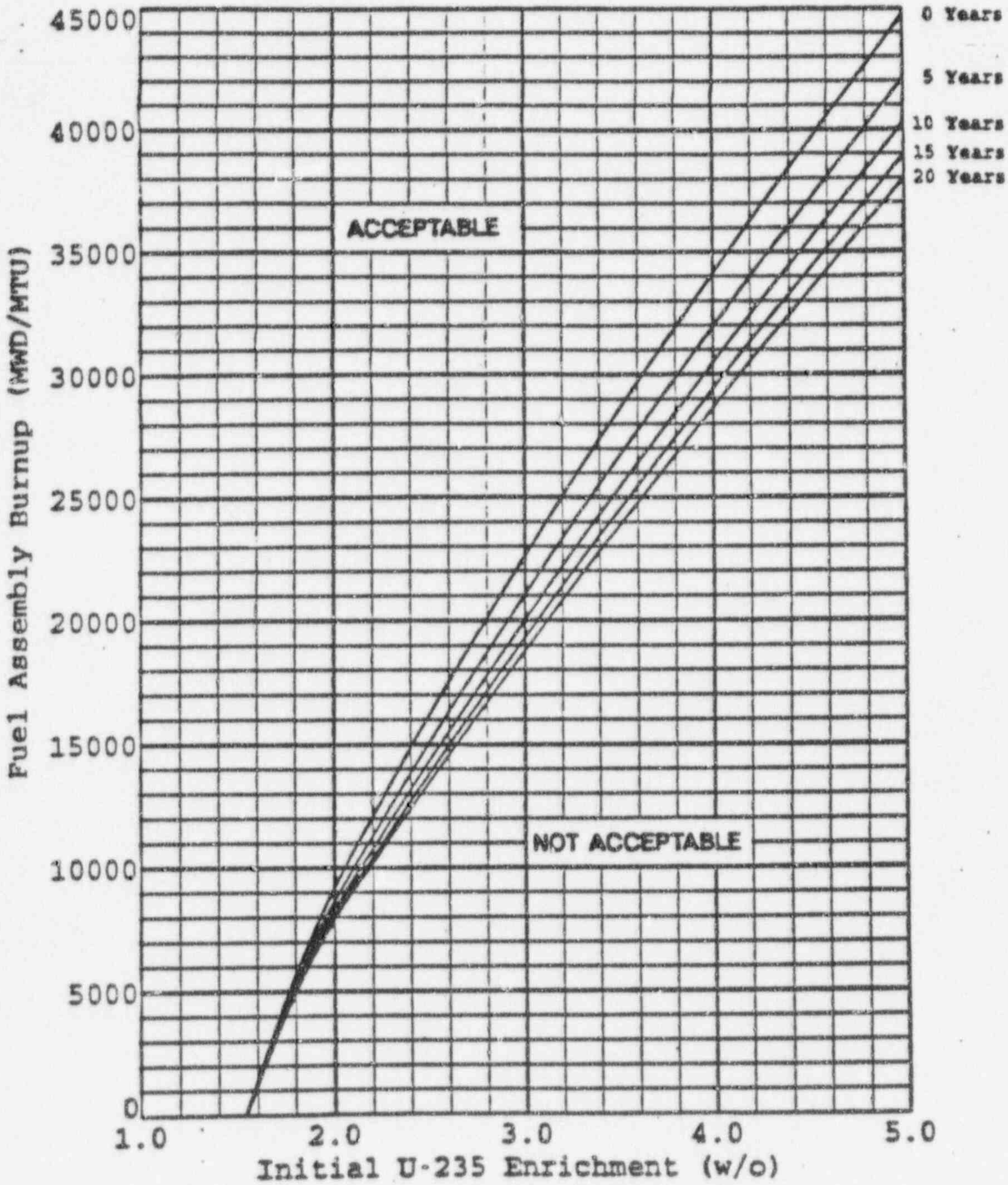
TS.5.6-7 Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - OFA Fuel, 8 GAD



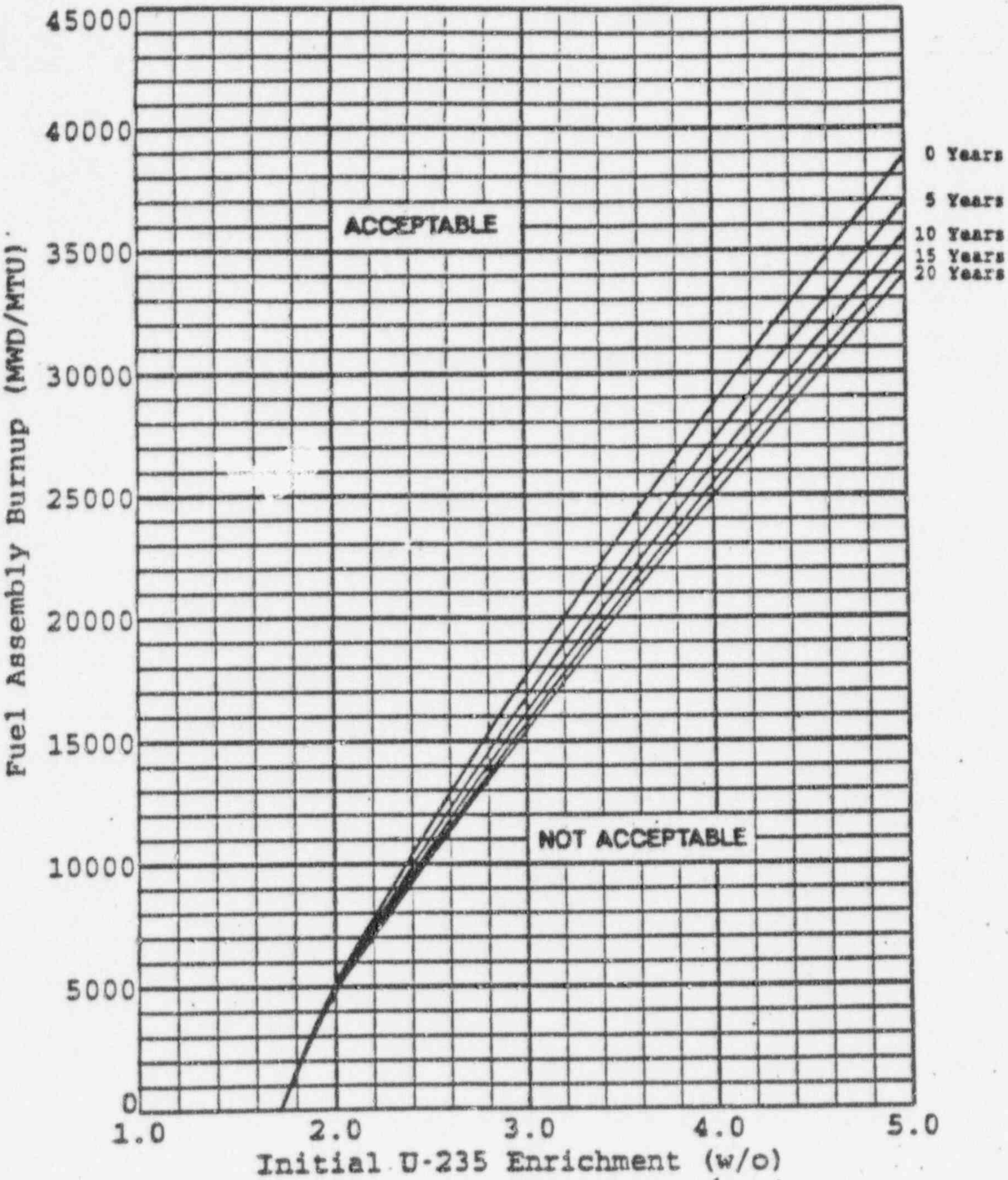
TS.5.6-8 Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - STD Fuel, 8 GAD



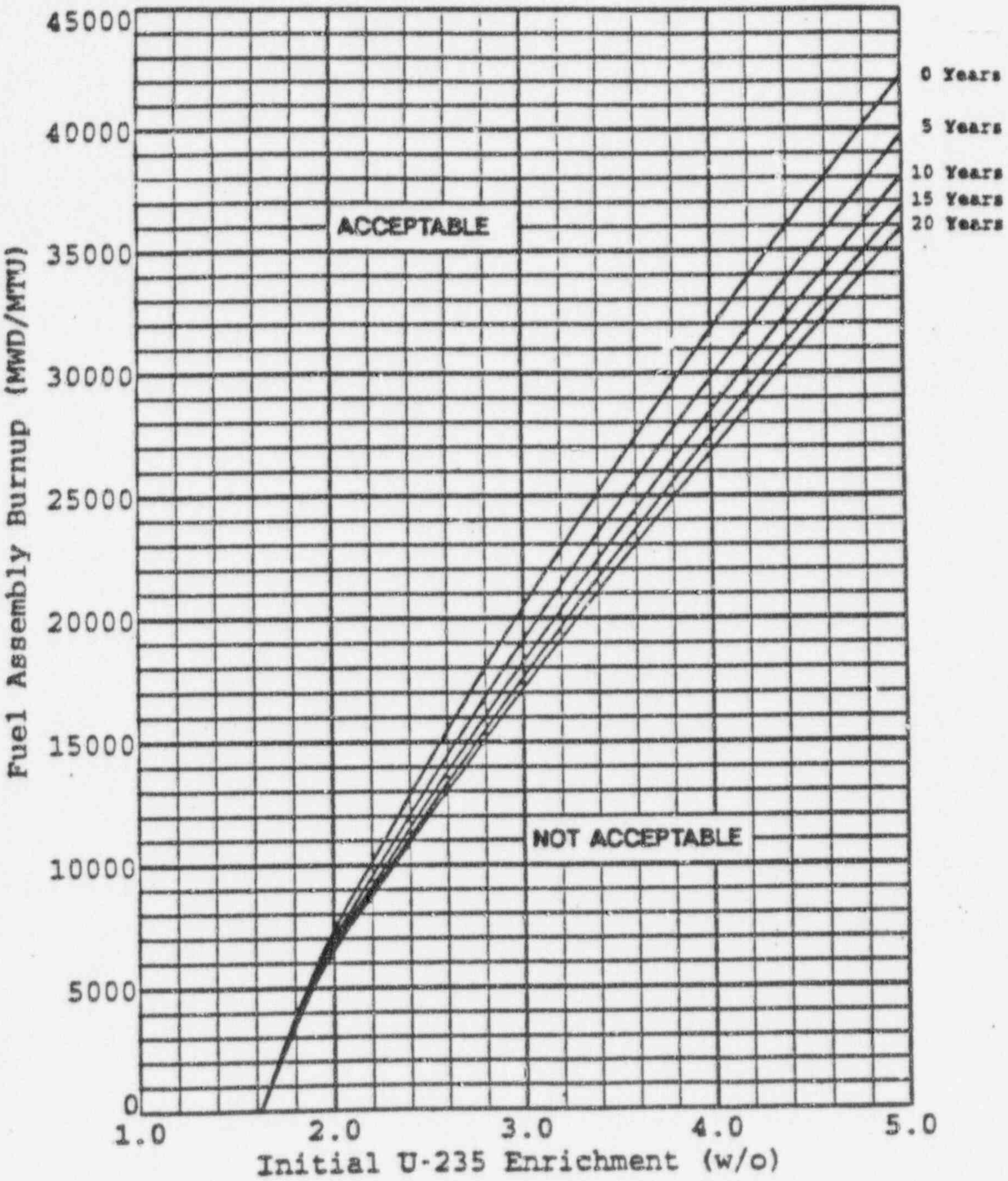
TS.5.6-9 Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - OFA Fuel, 12 GAD



TS.5.6-10 Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - STD Fuel, 12 GAD



TS.5.6-11 Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - OFA Fuel, 16 or More GAD



TS.5.6-12 Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - STD Fuel, 16 or More GAD

3.8 REFUELING AND FUEL HANDLING

Bases continued

The Spent Fuel Pool Special Ventilation System (Reference 3) is a safeguards system which maintains a negative pressure in the spent fuel enclosure upon detection of high area radiation. The Spent Fuel Pool Normal Ventilation System is automatically isolated and exhaust air is drawn through filter modules containing a roughing filter, particulate filter, and a charcoal filter before discharge to the environment via one of the Shield Building exhaust stacks. Two completely redundant trains are provided. The exhaust fan and filter of each train are shared with the corresponding train of the Containment In-service Purge System. High efficiency particulate absolute (HEPA) filters are installed before the charcoal adsorbers to prevent clogging of the iodine adsorbers in each SFPSVS filter train. The charcoal adsorbers are installed to reduce the potential release of radioiodine to the environment.

During movement of irradiated fuel assemblies or control rods, a water level of 23 feet is maintained to provide sufficient shielding.

The water level may be lowered to the top of the RCCA drive shafts for latching and unlatching. The water level may also be lowered below 20 feet for upper internals removal/replacement. The basis for these allowance(s) are (1) the refueling cavity pool has sufficient level to allow time to initiate repairs or emergency procedures to cool the core, (2) during latching/unlatching and upper internals removal/replacement the level is closely monitored because the activity uses this level as a reference point, (3) the time spent at this level is minimal.

The Prairie Island spent fuel storage racks have been analyzed (Reference 8) in accordance with the methodology contained in Reference 5. That methodology ensures that the spent fuel rack multiplication factor, K_{eff}, is less than 0.95 as recommended by ANSI 57.2-1983 (Reference 6) and NRC guidance (Reference 7). The codes, methods and techniques contained in the methodology are used to satisfy this criterion on K_{eff}. The resulting Prairie Island spent fuel rack criticality analysis allows for the storage of fuel assemblies with enrichments up to a maximum of 5.0 weight percent U-235 while maintaining $K_{eff} \leq 0.95$ including uncertainties and credit for soluble boron. In addition, sub-criticality of the pool ($K_{eff} < 1.0$) is assured on a 95/95 basis, without the presence of the soluble boron in the pool. Credit is taken for radioactive decay time of the spent fuel and for the presence of fuel rods containing Gadolinium burnable poison.

The Prairie Island specific criticality analysis (Reference 8) utilized the following storage configurations to ensure that the spent fuel pool will remain subcritical during the storage of fuel assemblies with all possible combinations of burnup and initial enrichment:

3.8 REFUELING AND FUEL HANDLING

Bases continued

1. The first storage configuration utilizes a checkerboard loading pattern to accommodate new or low burnup fuel with a maximum enrichment of 5.0 wt% U-235. This configuration stores "burned" and "fresh" fuel assemblies in a 3x3 checkerboard pattern as shown in Figure TS.5.6-1. Fuel assemblies stored in "burned" cell locations are selected based on a combination of fuel assembly type, initial enrichment, discharge burnup and decay time (Figures TS.5.6-3 through TS.5.6-12). The criteria for the fuel stored in the "burned" locations is also dependent on the number of rods containing Gadolinium in the center "fresh" fuel assembly. The use of empty cells is also an acceptable option for the "burned" cell locations. This will allow the storage of new or low burnup fuel assemblies in the outer rows of the spent fuel storage racks because the area outside the racks can be considered to be empty cells.

   Fuel assemblies that fall into the restricted range of Figures TS.3.8-1 or TS.3.8-2 are required to be stored in "fresh" cell locations as shown in Figure TS.5.6-1. The criteria included in Figures TS.3.8-1 and TS.3.8-2 for the selection of fuel assemblies to be stored in the "fresh" cell locations is based on a combination of fuel assembly type, initial enrichment, decay time and discharge burnup.

2. The second storage configuration does not utilize any special loading pattern. Fuel assemblies with burnup, initial enrichment and decay time which fall into the unrestricted range of Figures TS.3.8-1 or TS.3.8-2, as applicable, can be stored anywhere in the region with no special placement restrictions.

The burned/fresh fuel checkerboard region can be positioned anywhere within the spent fuel racks, but the boundary between the checkerboard region and the unrestricted region must be either:

1. separated by a vacant row of cells, or

2. the interface must be configured such that there is one row carryover of the pattern of burned assemblies from the checkerboard region into the first row of the unrestricted region (Figure TS.5.6-2).

Specifications 3.8.E.1, 5.6.A.1.d and 5.6.A.1.e ensure that fuel is stored in the spent fuel racks in accordance with the storage configurations assumed in the Prairie Island spent fuel rack criticality analysis (Reference 8).

The Prairie Island spent fuel pool criticality analysis addresses all the fuel types currently stored in the spent fuel pool and in use in the reactor. The fuel types considered in the analysis include the Westinghouse Standard (STD), OFA, and Vantage Plus designs, and the Exxon fuel assembly types in storage in the Prairie Island spent fuel pool. The OFA designation on the figures in Sections 3.8 and 5.6.A bound all of the Westinghouse OFA and Vantage Plus fuel assemblies at Prairie Island. The STD designation on the figures in Sections 3.8 and 5.6.A bound all of the Westinghouse STD and Exxon fuel assemblies at Prairie Island.

Bases continued

Most accident conditions in the spent fuel pool will not result in an increase in K_{eff} of the racks in either of the two storage configurations. Examples of those accident conditions which will not result in an increase in K_{eff} are a fuel assembly drop on the top of the racks, a fuel assembly drop between rack modules and wall (rack design precludes this condition), and a drop or placement of a fuel assembly into the cask loading area of the small pool. However, two accidents can be postulated which could increase reactivity. The first postulated accident would be a loss of the fuel pool cooling system and the second would be a misload of a fuel assembly into a cell for which the restrictions on location, enrichment, burnup, decay time or Gadolinium credit are not satisfied.

For an occurrence of these postulated accident conditions, the double contingency principle of ANSI/ANS-8.1-1983 can be applied. This states that one is not required to assume two unlikely, independent, concurrent events to ensure protection against a criticality accident. Thus, for these postulated accident conditions, the presence of additional soluble boron in the spent fuel pool water (above the 750 ppm required to maintain K_{eff} less than 0.95 under normal conditions) can be assumed as a realistic initial condition since not assuming its presence would be a second unlikely event.

Calculations were performed (Reference 8) to determine the amount of soluble boron required to offset the highest reactivity increase caused by either of these postulated accidents and to maintain K_{eff} less than or equal to 0.95. It was found that a spent fuel pool boron concentration of 1300 ppm was adequate to mitigate these postulated criticality related accidents and to maintain K_{eff} less than or equal to 0.95. Specification 3.8.E.2 ensures the spent fuel pool contains adequate dissolved boron to compensate for the increased reactivity caused by a mispositioned fuel assembly or a loss of spent fuel pool cooling. The 1800 ppm spent fuel pool boron concentration limit in Specification 3.8.E.2 was chosen to be consistent with the boron concentration limit required by Specification 3.8.B 1.c for a spent fuel cask containing fuel.

Specification 5.6.A.1.c requires that the spent fuel rack K_{eff} be less than or equal to 0.95 when flooded with water borated to 750 ppm. A spent fuel pool boron dilution analysis was performed which confirmed that sufficient time is available to detect and mitigate a dilution of the spent fuel pool before the 0.95 K_{eff} design basis is exceeded. The spent fuel pool boron dilution analysis concluded that an unplanned or inadvertent event which could result in the dilution of the spent fuel pool boron concentration from 1800 ppm to 750 ppm is not a credible event.

When the requirements of Specification 3.8.E.1.a are not met, immediate action must be taken to move any non complying fuel assembly to an acceptable location to preserve the double contingency principle assumption of the criticality accident analysis.

3.8 REFUELING AND FUEL HANDLING

Bases continued

When the concentration of boron in the spent fuel pool is less than required by Specification 3.8.E.2.a, immediate action must be taken to preclude the occurrence of an accident or to mitigate the consequences of an accident in progress. This is most efficiently achieved by immediately suspending the movement of fuel assemblies. The concentration of boron is restored simultaneously with suspending movement of fuel assemblies. The suspension of fuel movement is not intended to preclude movement of a fuel assembly to a safe position.

References

1. USAR, Section 10.2.1.2

2. USAR, Section 14.5.1

3. USAR, Section 10.3.7

4. "Criticality Analysis of the Prairie Island Units 1 & 2 Fresh and Spent Fuel Racks", Westinghouse Commercial Nuclear Fuel Division, February 1993.

5. WCAP-14416-NP-A, "Westinghouse Spent Fuel Rack Criticality Analysis Methodology", Revision 1, November 1996.

6. American Nuclear Society, "American National Standard Design Requirements for Light Water Reactor Fuel Storage Facilities at Nuclear Power Plants", ANSI/ANS-57.2-1983, October 7, 1983.

7. Nuclear Regulatory Commission, Letter to All Power Reactor Licensees from B. K. Grimes, "OT Position for Review and Acceptance of Spent Fuel Storage and Handling Applications", April 14, 1978.

8. "Northern States Power Prairie Island Units 1 and 2 Spent Fuel Rack Criticality Analysis Using Soluble Boron Credit", Westinghouse Commercial Nuclear Fuel Division, February 1997.

4.20 Spent Fuel Pool Storage Configuration

Bases

This surveillance verifies that the fuel assemblies in the spent fuel storage racks are stored in accordance with the requirements of Specifications 3.8.E.1, 5.6.A.1.d and 5.6.A.1.e.

The surveillance is required to be completed within 7 days after the completion of any fuel handling campaign which involves the relocation of fuel assemblies within the spent fuel pool or the addition of fuel assemblies to the spent fuel pool. The extent of a fuel handling campaign will be defined by plant administrative procedures. Examples of a fuel handling campaign would include all of the fuel handling performed during a refueling outage or associated with the placement of new fuel into the spent fuel pool.

It is not the intent of this surveillance to require the completion of a spent fuel pool inventory verification during interruptions in fuel handling during a defined fuel handling campaign. No spent fuel pool inventory verification is required following fuel movements where no fuel assemblies are relocated to different spent fuel rack locations.

The 7 day allowance for completion of this surveillance provides adequate time for the completion of a spent fuel pool inventory verification while minimizing the time a fuel assembly may be misloaded in the spent fuel pool. If a fuel assembly is misloaded during a fuel handling campaign, the minimum boron concentration required by Specification 3.8.E.2 will ensure that the spent fuel rack K_{eff} remains within limits until the spent fuel pool inventory verification is performed.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

NORTHERN STATES POWER COMPANY

DOCKET NO. 50-306

PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 121
License No. DPR-60

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

   A. The application for amendment by Northern States Power Company (the licensee) dated July 28, 1995, as revised February 21, 1997, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

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

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

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

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

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. DPR-60 is hereby amended to read as follows:

Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 121, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of issuance, with full implementation within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION

Beth A. Wetzel

Beth A. Wetzel, Project Manager
Project Directorate III-1
Division of Reactor Projects - III/IV
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: June 12, 1997

ATTACHMENT TO LICENSE AMENDMENT NO. 121

FACILITY OPERATING LICENSE NO. DPR-60

DOCKET NO. 50-306

Revise Appendix A Technical Specifications by removing the pages identified below and inserting the attached pages. The revised pages are identified by amendment number and contain vertical lines indicating the area of change.

REMOVE	INSERT
TS-vi	TS-vi
TS-xi	TS-xi
TS-xiii	TS-xiii
TS.3.8-4	TS.3.8-4
TS.3.8-5	--
Figure TS.3.8-1	Figure TS.3.8-1
--	Figure TS.3.8-2
Table TS.4.1-2B (Page 1 of 2)	Table TS.4.1-2B (Page 1 of 2)
Table TS.4.1-2B (Page 2 of 2)	Table TS.4.1-2B (Page 2 of 2)
--	TS.4.20-1
TS.5.6-1	TS.5.6-1
TS.5.6-3	TS.5.6-3
Figure TS.5.6-1	Figure TS.5.6-1
Figure TS.5.6-2	Figure TS.5.6-2
--	Figure TS.5.6-3
--	Figure TS.5.6-4
--	Figure TS.5.6-5
--	Figure TS.5.6-6
--	Figure TS.5.6-7
--	Figure TS.5.6-8
--	Figure TS.5.6-9
--	Figure TS.5.6-10
--	Figure TS.5.6-11
--	Figure TS.5.6-12
B.3.8-2	B.3.8-2
B.3.8-3	B.3.8-3
B.3.8-4	B.3.8-4
--	B.3.8-5
--	B.4.20-1

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	B. Steam Generator Tube Sample Selection and Inspection	TS.4.12-1
	C. Inspection Frequencies	TS.4.12-3
	D. Acceptance Criteria	TS.4.12-4
	E. Reports	TS.4.12-5
4.13	Snubbers	TS.4.13-1
4.14	Control Room Air Treatment System Tests	TS.4.14-1
4.15	Spent Fuel Pool Special Ventilation System	TS.4.15-1
4.16	Deleted	
4.17	Deleted	
4.18	Reactor Coolant Vent System Paths	TS.4.18-1
	A. Vent Path Operability	TS.4.18-1
	B. System Flow Testing	TS.4.18-1
4.19	Auxiliary Building Crane Lifting Devices	TS.4.19-1
4.20	Spent Fuel Pool Storage Configuration	TS.4.20-1

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	4.2	Inservice Inspection and Testing of Pumps and Valves Requirements	B.4.2-1
	4.3	Primary Coolant System Pressure Isolation Valves	B.4.3-1
	4.4	Containment System Tests	B.4.4-1
	4.5	Engineered Safety Features	B.4.5-1
	4.6	Periodic Testing of Emergency Power Systems	B.4.6-1
	4.7	Main Steam Isolation Valves	B.4.7-1
	4.8	Steam and Power Conversion Systems	B.4.8-1
	4.9	Reactivity Anomalies	B.4.9-1
	4.10	Deleted	
	4.11	Deleted	
	4.12	Steam Generator Tube Surveillance	B.4.12-1
	4.13	Snubbers	B.4.13-1
	4.14	Control Room Air Treatment System Tests	B.4.14-1
	4.15	Spent Fuel Pool Special Ventilation System	B.4.15-1
	4.16	Deleted	
	4.17	Deleted	
	4.18	Reactor Coolant Vent System Paths	B.4.18-1
	4.19	Auxiliary Building Crane Lifting Devices	B.4.19-1
	4.20	Spent Fuel Pool Storage Configuration	B.4.20-1

APPENDIX A TECHNICAL SPECIFICATIONS

LIST OF FIGURES

TS FIGURE	TITLE
2.1-1	Reactor Core Safety Limits
3.1-1	Unit 1 and Unit 2 Reactor Coolant System Heatup Limitations
3.1-2	Unit 1 and Unit 2 Reactor Coolant System Cooldown Limitations
3.1-3	DOSE EQUIVALENT I-131 Primary Coolant Specific Activity Limit Versus Percent of RATED THERMAL POWER with the Primary Coolant Specific Activity >1.0 uCi/gram DOSE EQUIVALENT I-131
3.8-1	Spent Fuel Pool Unrestricted Region Burnup and Decay Time Requirements - OFA Fuel
3.8-2	Spent Fuel Pool Unrestricted Region Burnup and Decay Time Requirements - STD Fuel
3.10-1	Required Shutdown Margin Vs Reactor Boron Concentration
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5.6-4	Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - STD Fuel, No GAD
5.6-5	Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - OFA Fuel, 4 GAD
5.6-6	Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - STD Fuel, 4 GAD
5.6-7	Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - OFA Fuel, 8 GAD
5.6-8	Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - STD Fuel, 8 GAD
5.6-9	Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - OFA Fuel, 12 GAD
5.6-10	Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - STD Fuel, 12 GAD
5.6-11	Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - OFA Fuel, 16 or More GAD
5.6-12	Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - STD Fuel, 16 or More GAD
B.2.1-1	Origin of Safety Limit Curves at 2235 psig with delta-T Trips and Locus of Reactor Conditions at which SG Safety Valves Open

3.8.C. Small Spent Fuel Pool Restrictions

No more than 45 recently discharged assemblies shall be located in the small pool (pool No. 1).

D. Spent Fuel Pool Special Ventilation System

1. Both trains of the Spent Fuel Pool Special Ventilation System shall be OPERABLE at all times (except as specified in 3.8.D.2 and 3.8.D.3 below).

2. With one train of the Spent Fuel Pool Special Ventilation System inoperable, fuel handling operations and crane operations with loads over spent fuel (inside the spent fuel pool enclosure) are permissible during the following 7 days, provided the redundant train is demonstrated OPERABLE prior to proceeding with those operations.

3. With both trains of the Spent Fuel Pool Special Ventilation System inoperable, suspend all fuel handling operations and crane operations with loads over spent fuel (inside the spent fuel pool enclosure).

4. The provisions of specification 3.0.C are not applicable.

E. Spent Fuel Pool Storage

1. Fuel Assembly Storage

   a. The combination of initial enrichment, burnup and decay time of each spent fuel assembly stored in the spent fuel pool shall be within the unrestricted range of Figures TS.3.8-1 or TS.3.8-2, as applicable, or fuel assemblies shall be stored in accordance with Specification 5.6.A.1.e.

   b. If the requirements of 3.8.E.1.a are not met, immediately initiate action to move any noncomplying fuel assembly to an acceptable location.

   c. The provisions of Specification 3.0.C are not applicable.

2. Spent Fuel Pool Boron Concentration

   a. The spent fuel pool boron concentration shall be ≥ 1,800 ppm when fuel assemblies are stored in the spent fuel pool.

   b. If the spent fuel pool boron concentration is not within limit, then immediately:

      1. Suspend movement of fuel assemblies in the spent fuel pool, and

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

   c. The provisions of Specification 3.0.C are not applicable.

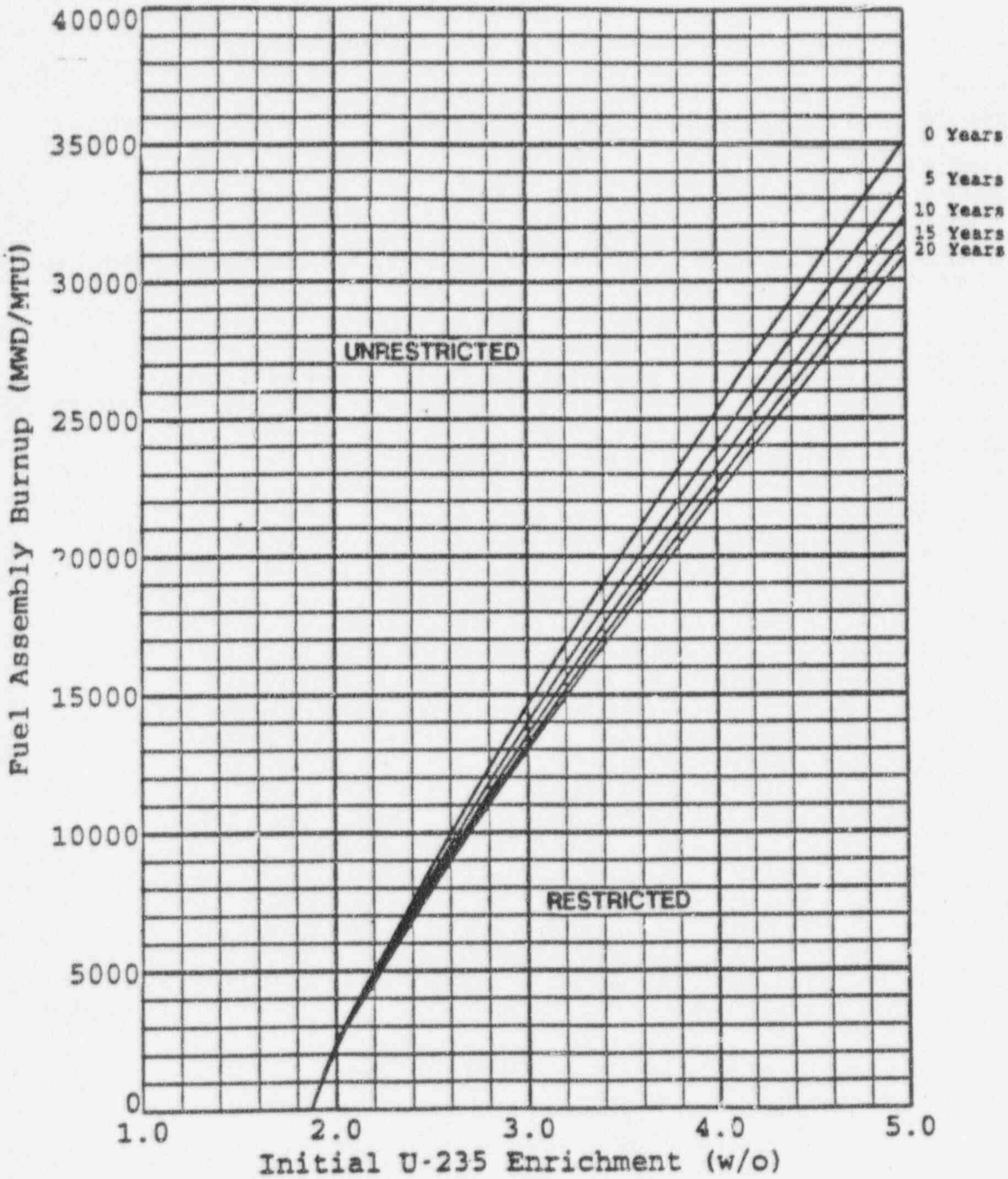


FIGURE TS.3.8-1 Spent Fuel Pool Unrestricted Region Burnup and Decay Time Requirements - OFA Fuel

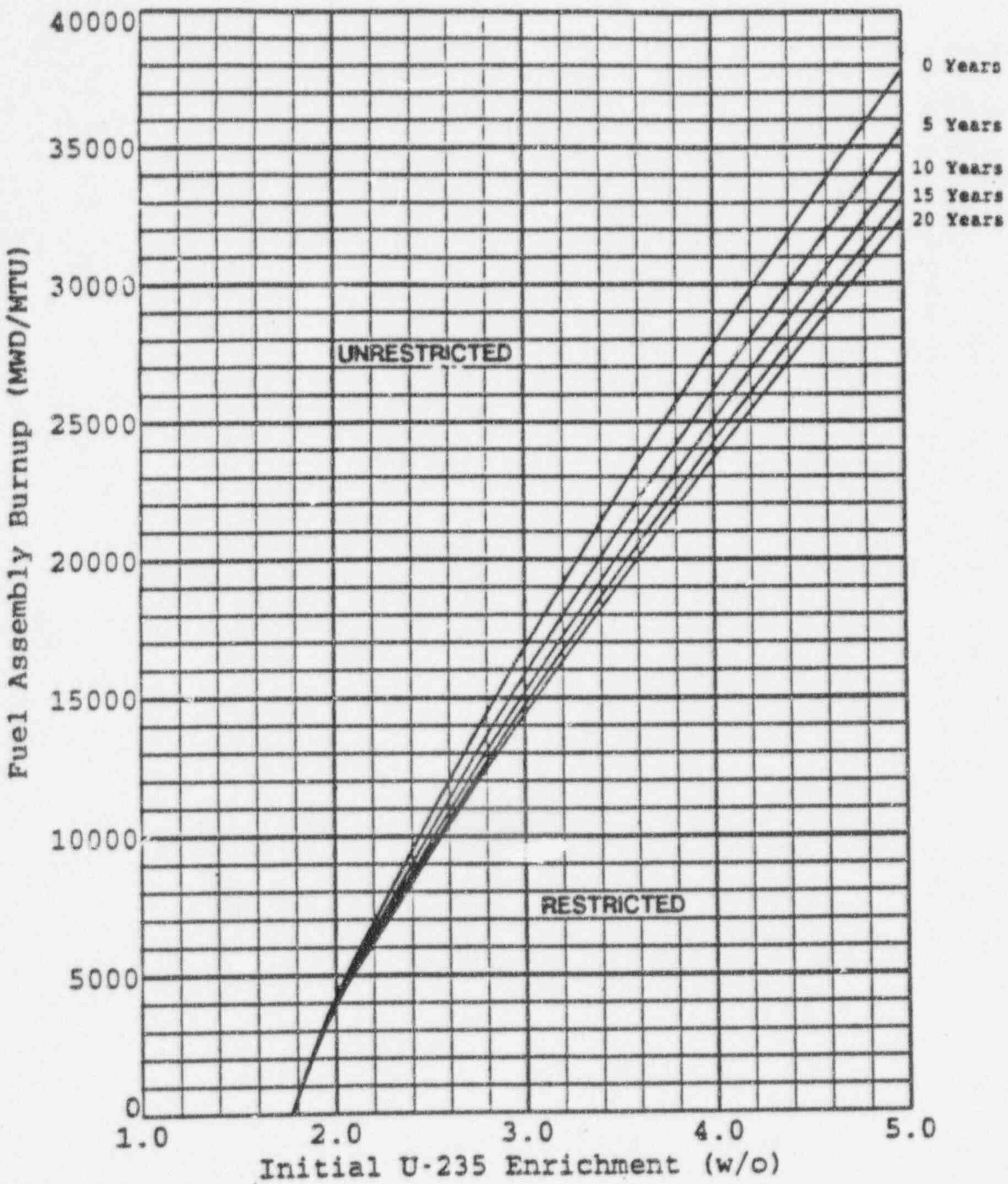


FIGURE TS.3.8-2 Spent Fuel Pool Unrestricted Region Burnup and Decay Time Requirements - STD Fuel

TABLE TS.4.1-2B

MINIMUM FREQUENCIES FOR SAMPLING TESTS

TEST	FREQUENCY
1. RCS Gross Activity Determination	5/week
2. RCS Isotopic Analysis for DOSE EQUIVALENT I-131 Concentration	1/14 days (when at power)
3. RCS Radiochemistry $\bar{E}$ determination	1/6 months(1) (when at power)
4. RCS Isotopic Analysis for Iodine Including I-131, I-133, and I-135	a) Once per 4 hours, whenever the specific activity exceeds 1.0 uCi/gram DOSE EQUIVALENT I-131 or 100/$\bar{E}$ uCi/gram (at or above cold shutdown), and b) One sample between 2 and 6 hours following THERMAL POWER change exceeding 15 percent of the RATED THERMAL POWER within a one hour period (above hot shutdown)
5. RCS Radiochemistry (2)	Monthly
6. RCS Tritium Activity	Weekly
7. RCS Chemistry (Cl*, F*, O_2)	5/Week
8. RCS Boron Concentration*(3)	2/Week (4)
9. RWST Boron Concentration	Weekly
10. Boric Acid Tanks Boron Concentration	2/Week
11. Caustic Standpipe NaOH Concentration	Monthly
12. Accumulator Boron Concentration	Monthly
13. Spent Fuel Pit Boron Concentration	Weekly

* Required at all times.

TABLE TS.4.1-2B

MINIMUM FREQUENCIES FOR SAMPLING TESTS

TEST	FREQUENCY
14. Secondary Coolant Gross Beta-Gamma activity	Weekly
15. Secondary Coolant Isotopic Analysis for DOSE EQUIVALENT I-131 concentration	1/6 months (5)
16. Secondary Coolant Chemistry	
pH	5/week (6)
pH Control Additive	5/week (6)
Sodium	5/week (6)

Notes:

1. Sample to be taken after a minimum of 2 EFPD and 20 days of POWER OPERATION have elapsed since reactor was last subcritical for 48 hours or longer.

2. To determine activity of corrosion products having a half-life greater than 30 minutes.

3. During REFUELING, the boron concentration shall be verified by chemical analysis daily.

4. The maximum interval between analyses shall not exceed 5 days.

5. If activity of the samples is greater than 10% of the limit in Specification 3.4.D, the frequency shall be once per month.

6. The maximum interval between analyses shall not exceed 3 days.

4.20 Spent Fuel Pool Storage Configuration

Applicability

This surveillance is applicable whenever fuel is stored in the spent fuel pool.

Objective

To verify that fuel assemblies in the spent fuel pool are stored in accordance with the requirements of Specification 3.8.E.1.a.

Specification

A spent fuel pool inventory verification shall be performed within 7 days of the completion of any fuel handling campaign which involves the relocation of fuel assemblies within the spent fuel pool or the addition of fuel assemblies to the spent fuel pool.

5.6 FUEL HANDLING

A. Criticality Consideration

1. The spent fuel storage racks are designed (Reference 1) and shall be maintained with:

    a. Fuel assemblies having a maximum U-235 enrichment of 5.0 weight percent;

    b. $K_{eff} < 1.0$ if fully flooded with unborated water, which includes an allowance for uncertainties as described in Reference 3;

    c. $K_{eff} \leq 0.95$ if fully flooded with water borated to 750 ppm, which includes an allowance for uncertainties as described in Reference 3;

    d. New or spent fuel assemblies with a combination of discharge burnup, initial enrichment and decay time in the unrestricted range of Figures TS.3.8-1 or TS.3.8-2, as applicable, may be allowed unrestricted storage in the spent fuel racks; and

    e. New or spent fuel assemblies with a combination of discharge burnup, initial enrichment and decay time in the restricted range of Figures TS.3.8-1 or TS.3.8-2, as applicable, will be stored in compliance with Figures TS.5.6-1 through TS.5.6-12.

2. The new fuel storage racks are designed (Reference 1) and shall be maintained with:

    a. Fuel asremblies having a maximum U-235 enrichment of 5.0 weight percent;

    b. $K_{eff} \leq 0.95$ if fully flooded with unborated water, which includes an allowance for uncertainties as described in Reference 2; and

    c. $K_{eff} \leq 0.98$ if accidentally filled with a low density moderator which resulted in optimum low density moderation conditions.

3. Fuel will not be inserted into a spent fuel cask in the pool, unless a minimum boron concentration of 1800 ppm is present. The 1800 ppm will ensure that k_{eff} for the spent fuel cask, including statistical uncertainties, will be less than or equal to 0.95 for all postulated arrangements of fuel within the cask. The criticality analysis for the TN-40 spent fuel storage cask was based on fresh fuel enriched to 3.85 weight percent U-235.

B. Spent Fuel Storage Structure

The spent fuel storage pool is enclosed with a reinforced concrete building having 12- to 18-inch thick walls and roof (Reference 1). The pool and pool enclosure are Class I (seismic) structures that afford protection against loss of integrity from postulated tornado missiles. The storage compartments and the fuel transfer canal are connected by fuel transfer slots that can be closed off with pneumatically sealed gates. The bottoms of the slots are above the tops of the active fuel in the fuel assemblies which will be stored vertically in specially constructed racks.

D. Spent Fuel Storage Capacity

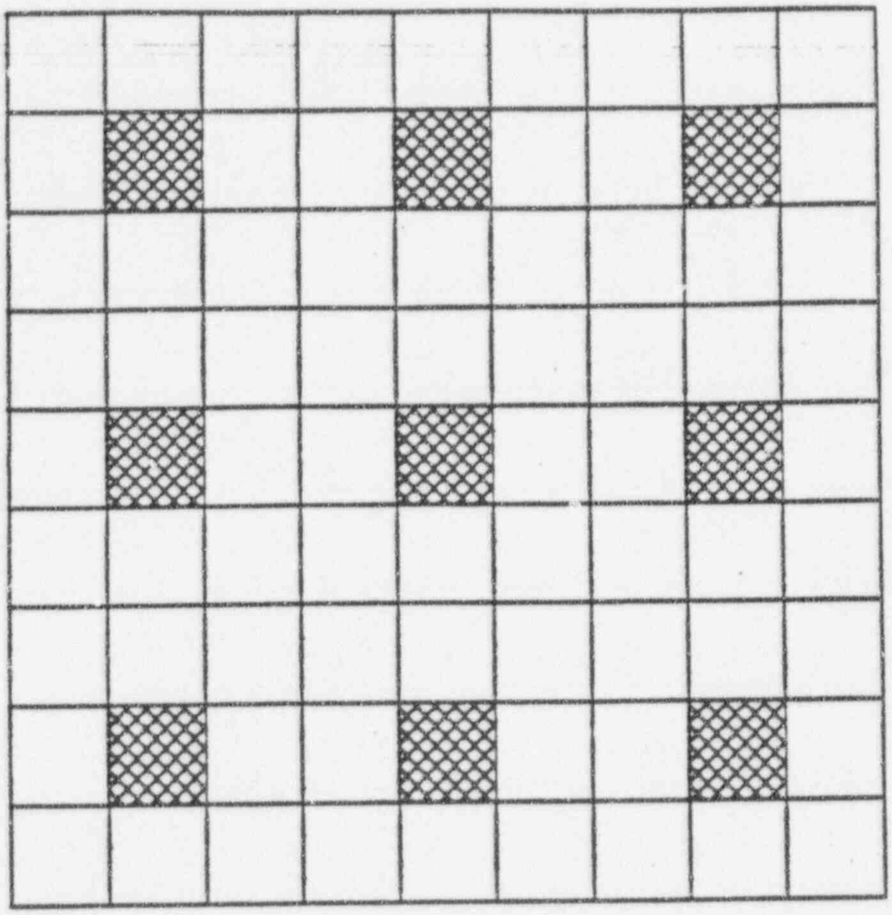
The spent fuel storage facility is a two-compartment pool that, if completely filled with fuel storage racks, provides up to 1582 storage locations. The southeast corner of the small pool (pool no. 1) also serves as the cask lay down area. During times when the cask is being used, four racks are removed from the small pool. With the four storage racks in the southeast corner of pool 1 removed, a total of 1386 storage locations are provided. To allow insertion of a spent fuel cask, total storage is limited to 1386 assemblies, not including those assemblies which can be returned to the reactor.

Reference

1. USAR, Section 10.2

2. "Criticality Analysis of the Prairie Island Units 1 & 2 Fresh and Spent Fuel Racks", Westinghouse Commercial Nuclear Fuel Division, February 1993.

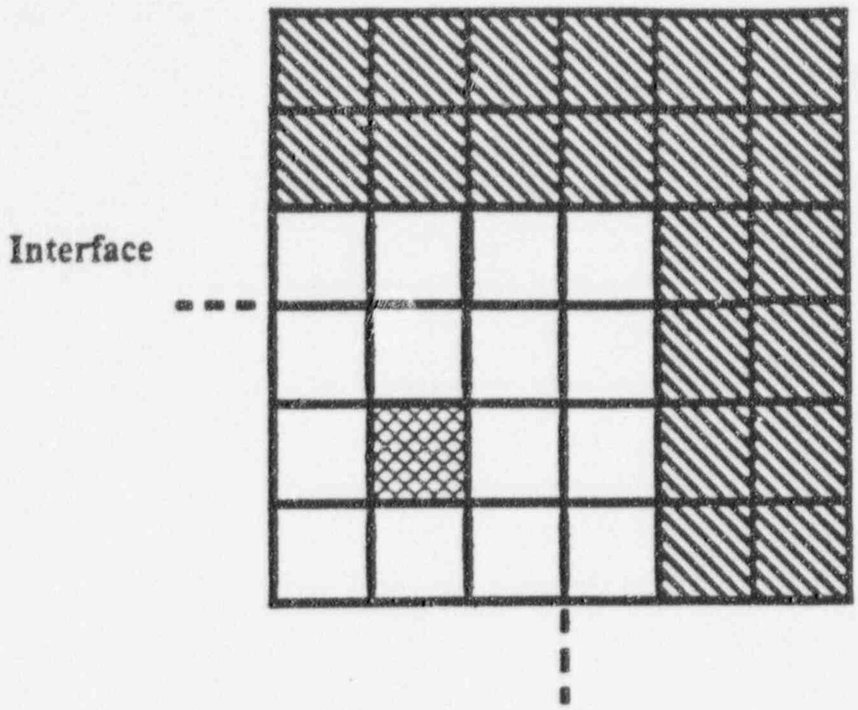
3. "Northern States Power Prairie Island Units 1 and 2 Spent Fuel Rack Criticality Analysis Using Soluble Boron Credit", Westinghouse Commercial Nuclear Fuel Division, February 1997.



Fresh Fuel: Must be less than or equal to nominal 4.95 w/o ^{235}U
No restrictions on burnup

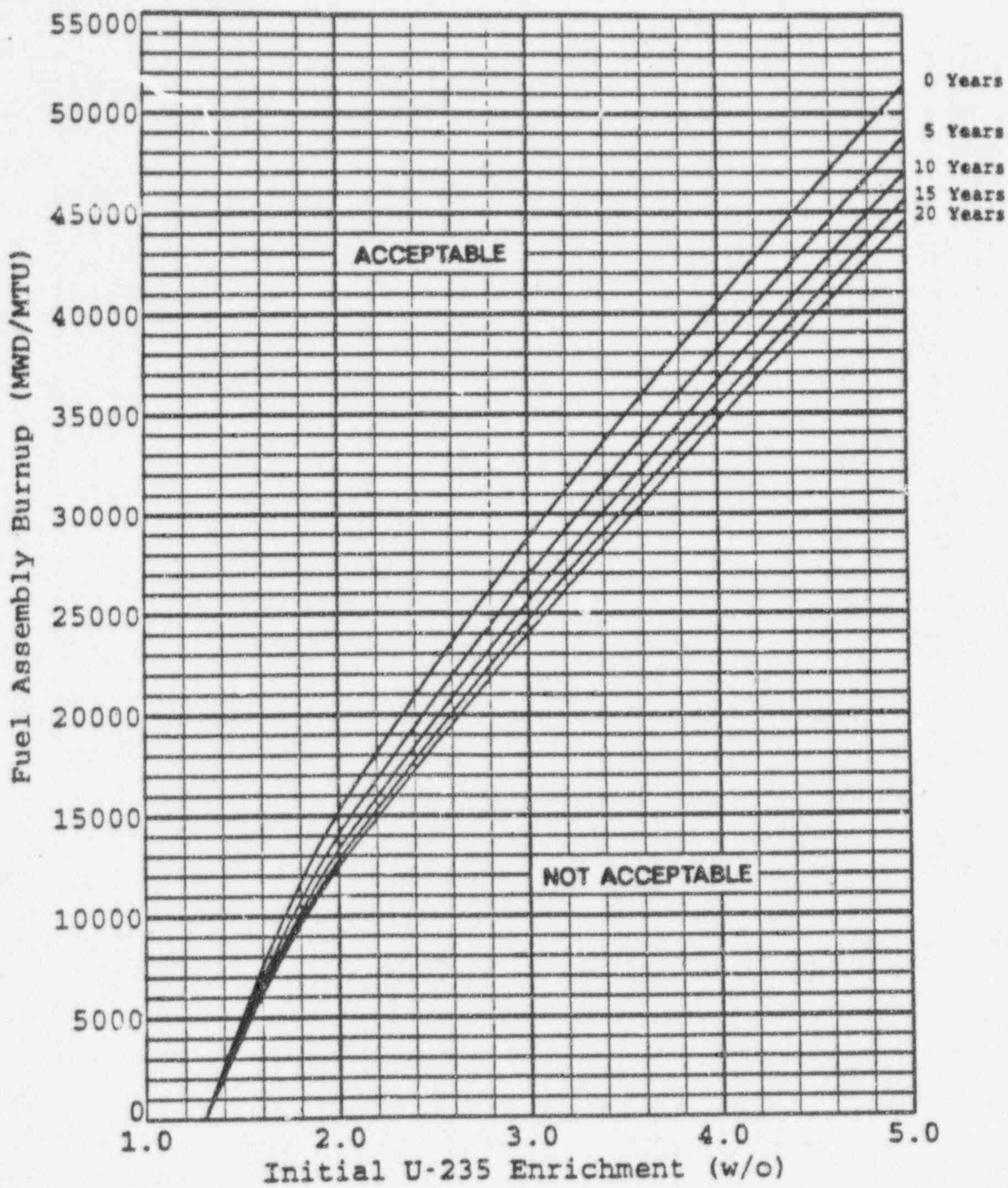
Burned Fuel: Must satisfy minimum burnup requirements of Figures TS.5.6-3 through TS.5.6-12 depending on number of CAD rods in fresh fuel

FIGURE TS.5.6-1 Spent Fuel Pool Burned/Fresh Checkerboard Cell Layout

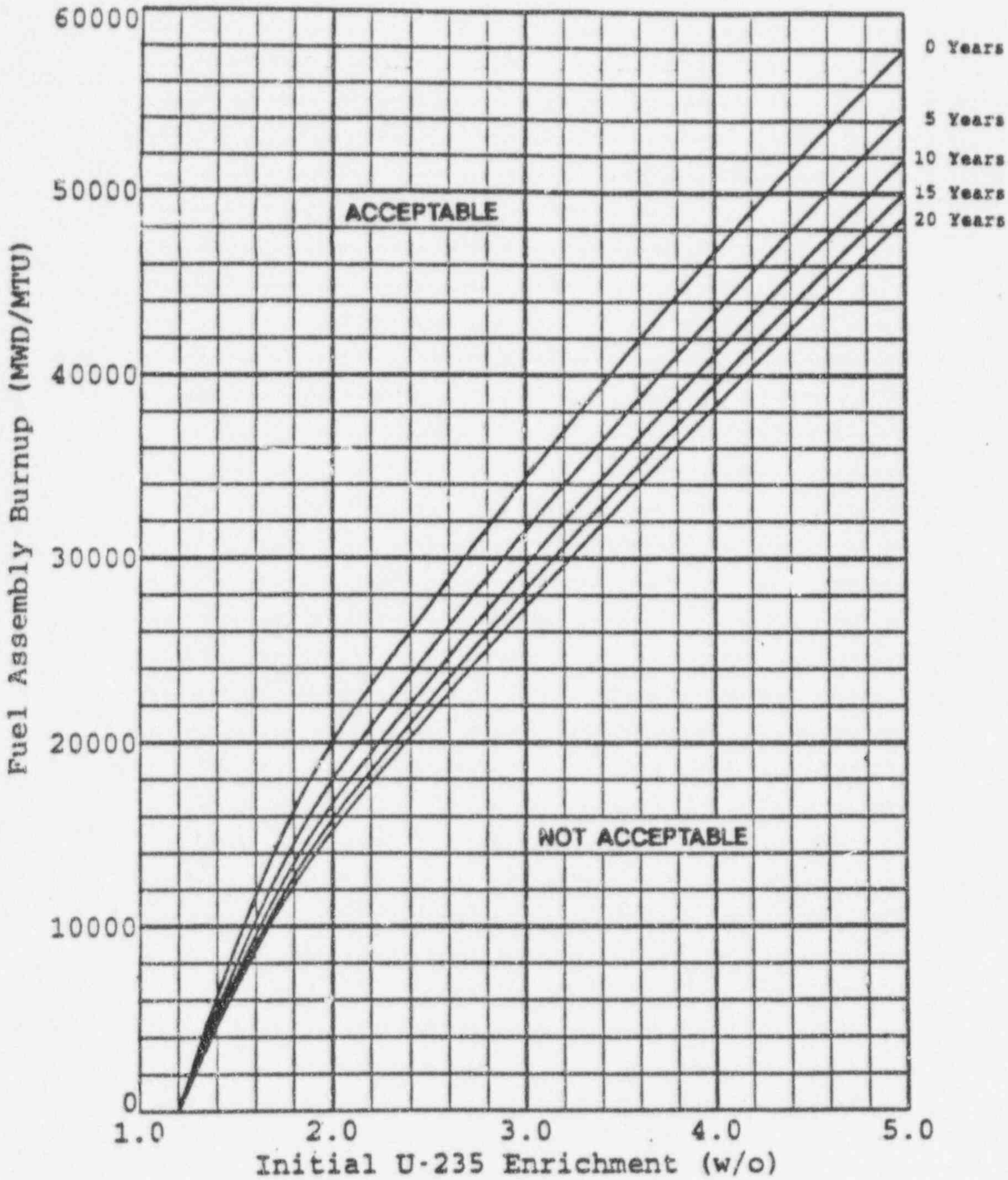


Fresh Fuel:	Must be less than or equal to nominal 4.95 w/o ^{235}U No restrictions on burnup	
Burned Fuel:	3x3 Checkerboard Region Must satisfy minimum burnup requirements of Figures TS.5.6-3 through TS.5.6-12	
Burned Fuel:	All Cell Unrestricted Region Must satisfy minimum burnup requirements of Figures TS.3.8-1 or TS.3.8-2	

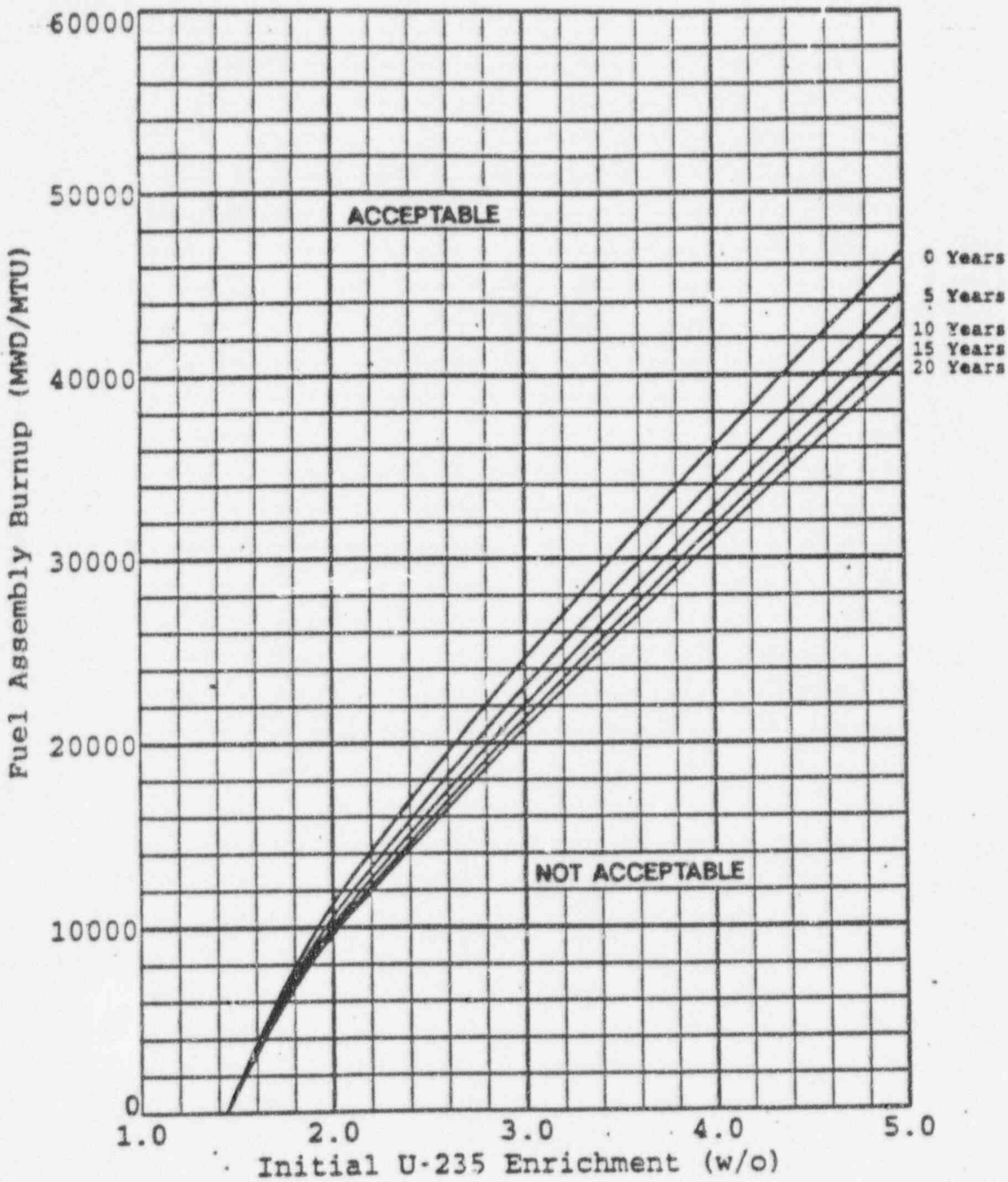
FIGURE TS.5.6-2 Spent Fuel Pool Checkerboard Interface Requirements



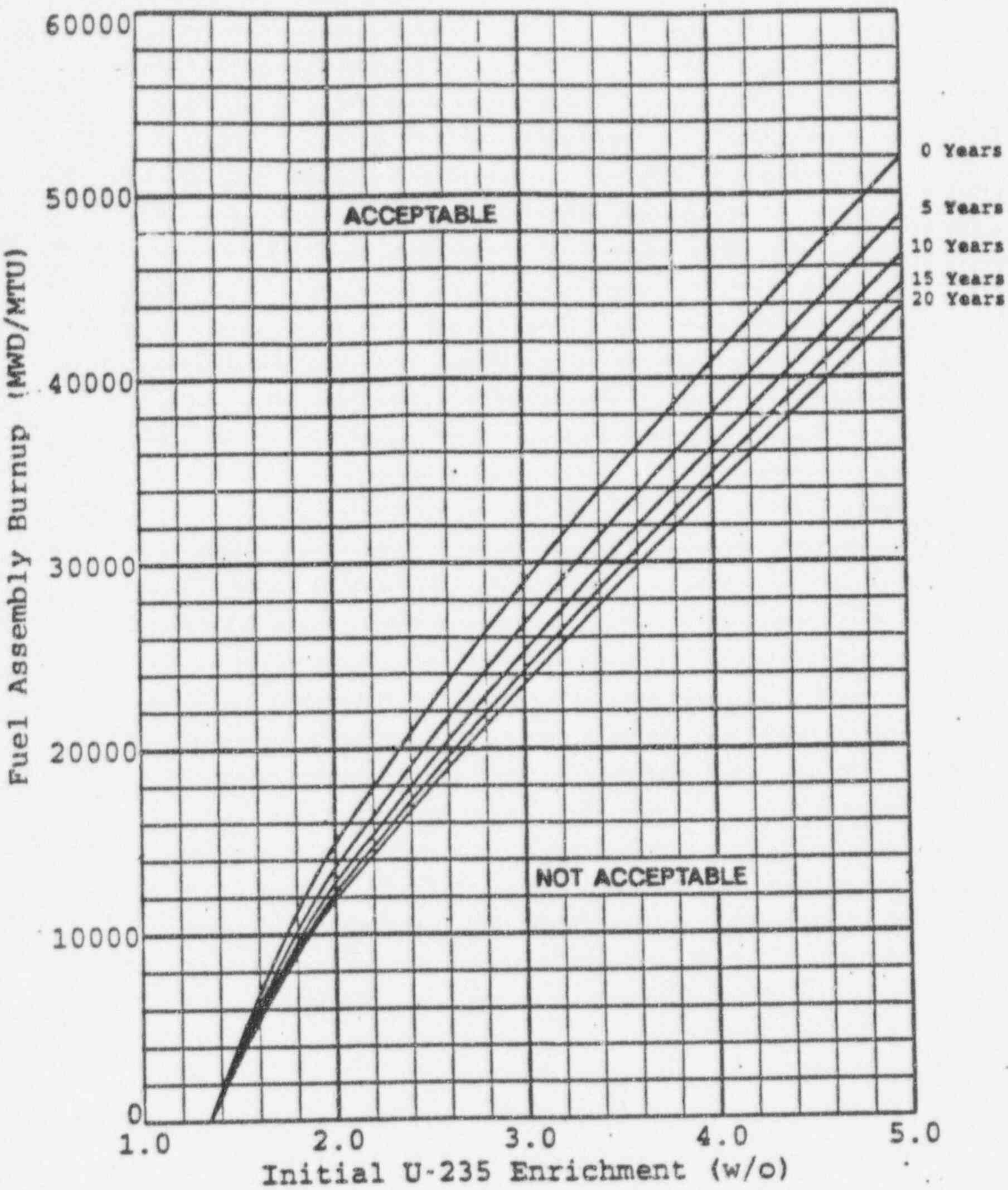
TS.5.6-3 Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - OFA Fuel, No GAD



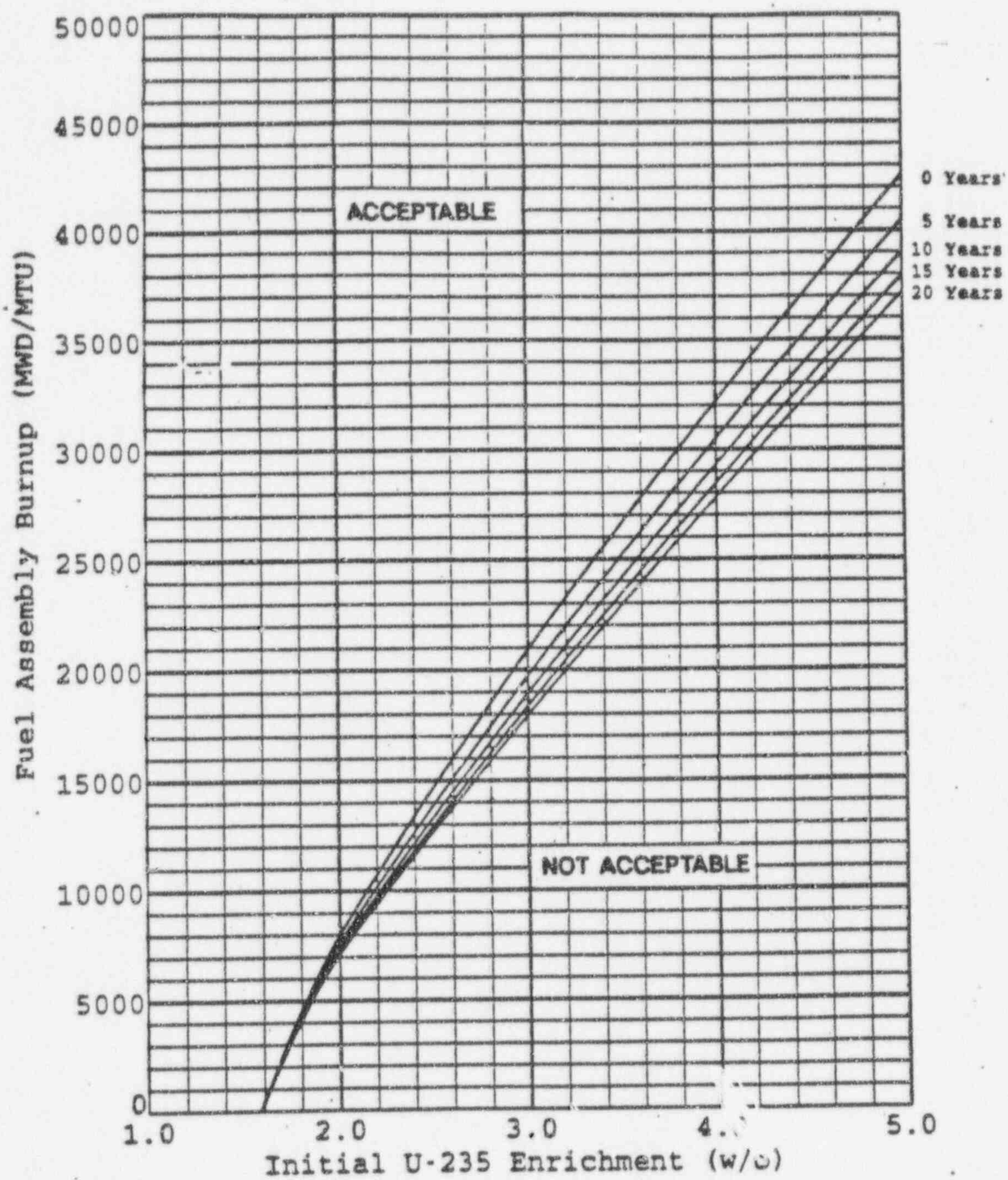
TS.5.6-4 Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - STD Fuel, No GAD



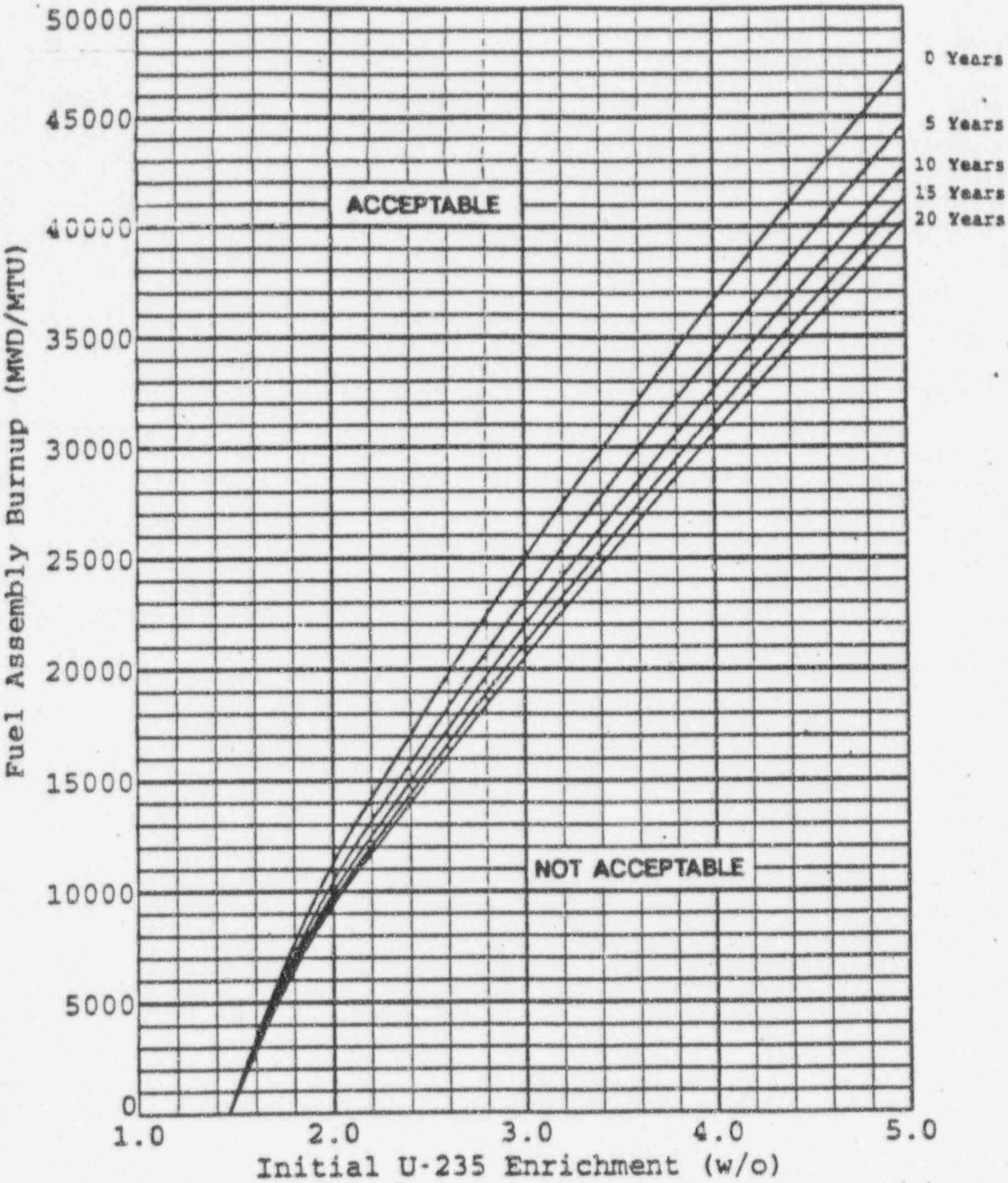
TS.5.6-5 Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - OFA Fuel, 4 GAD



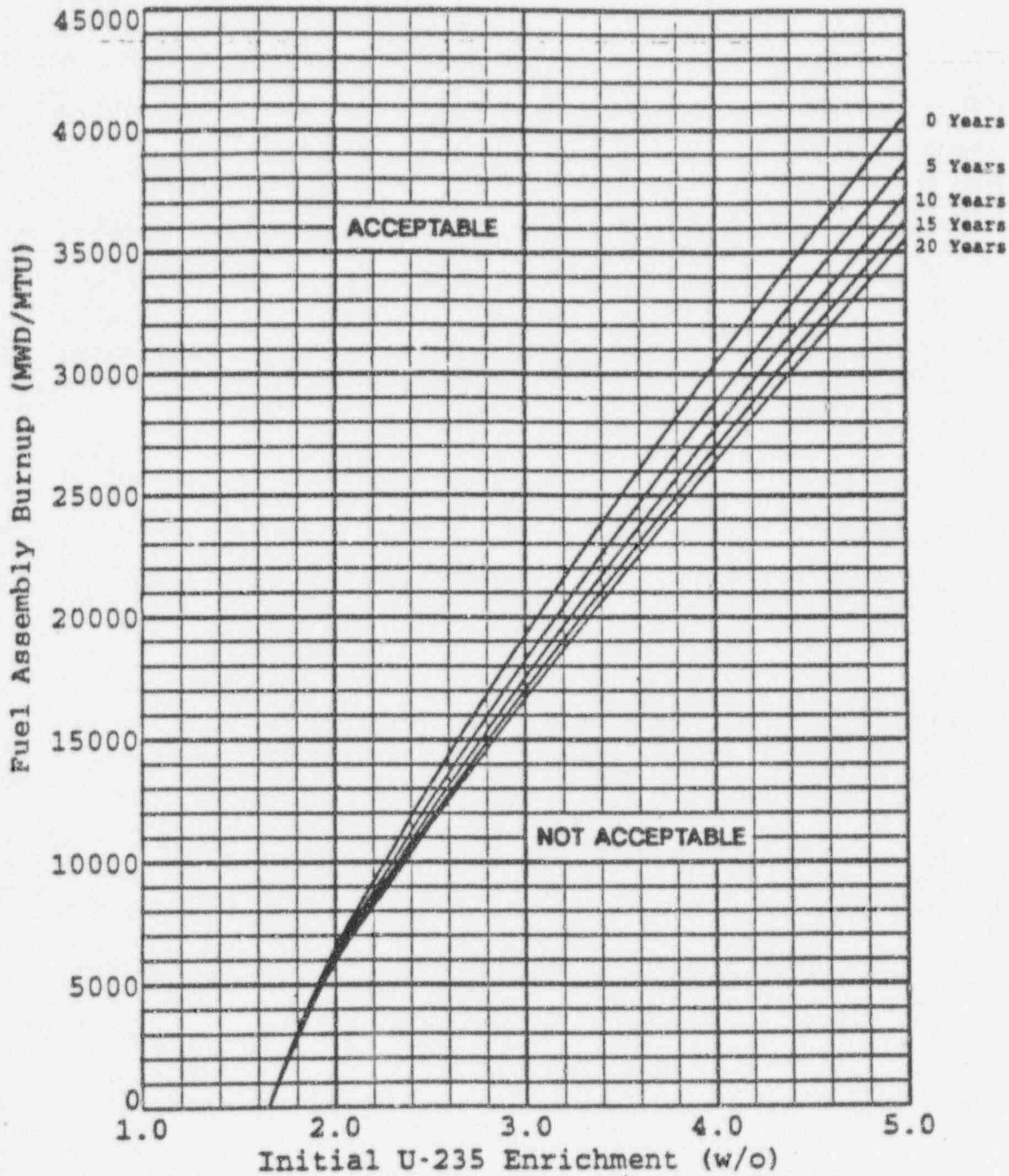
TS.5.6-6 Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - STD Fuel, 4 GAD



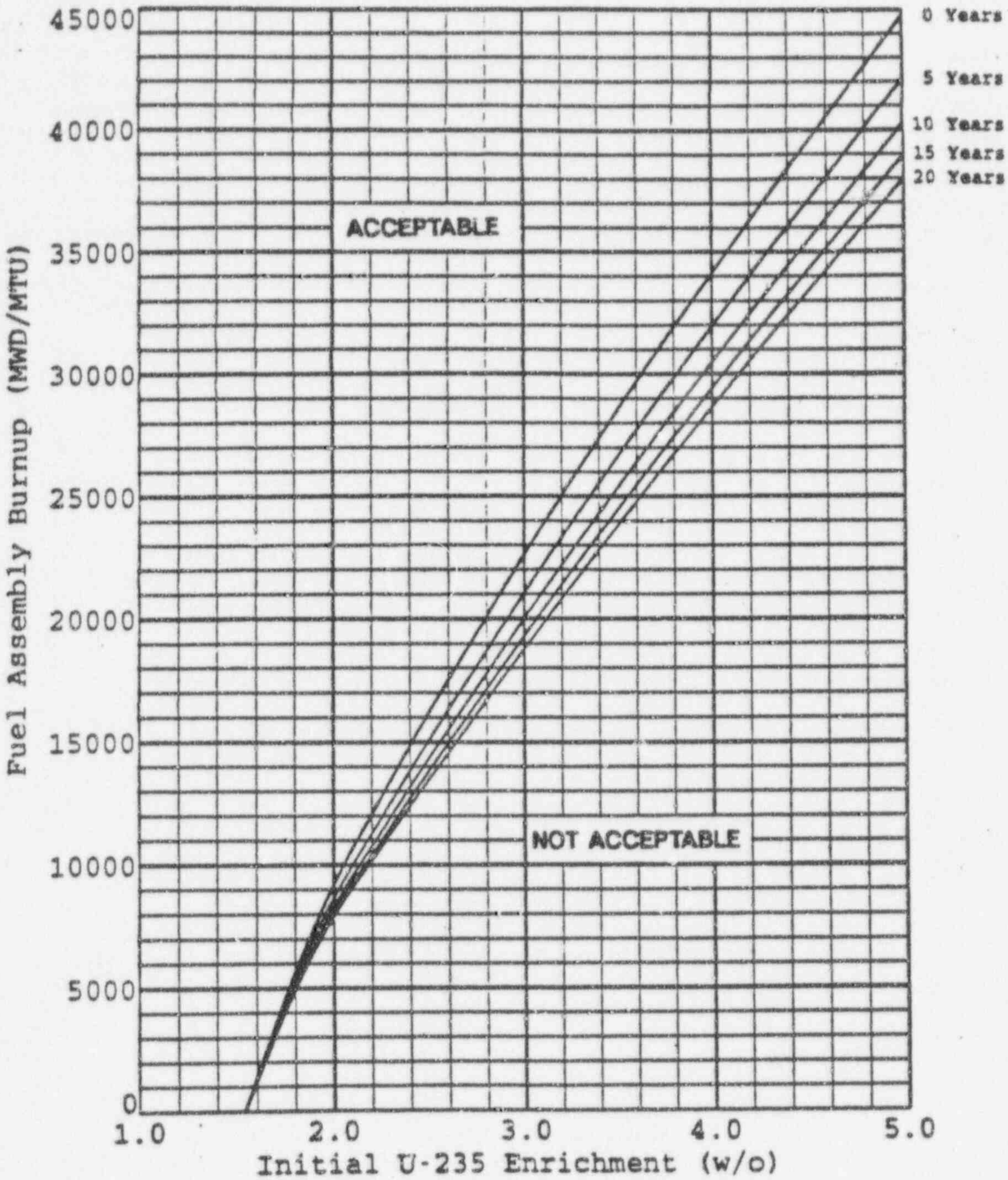
TS.5.6-7 Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - OFA Fuel, 8 GAD



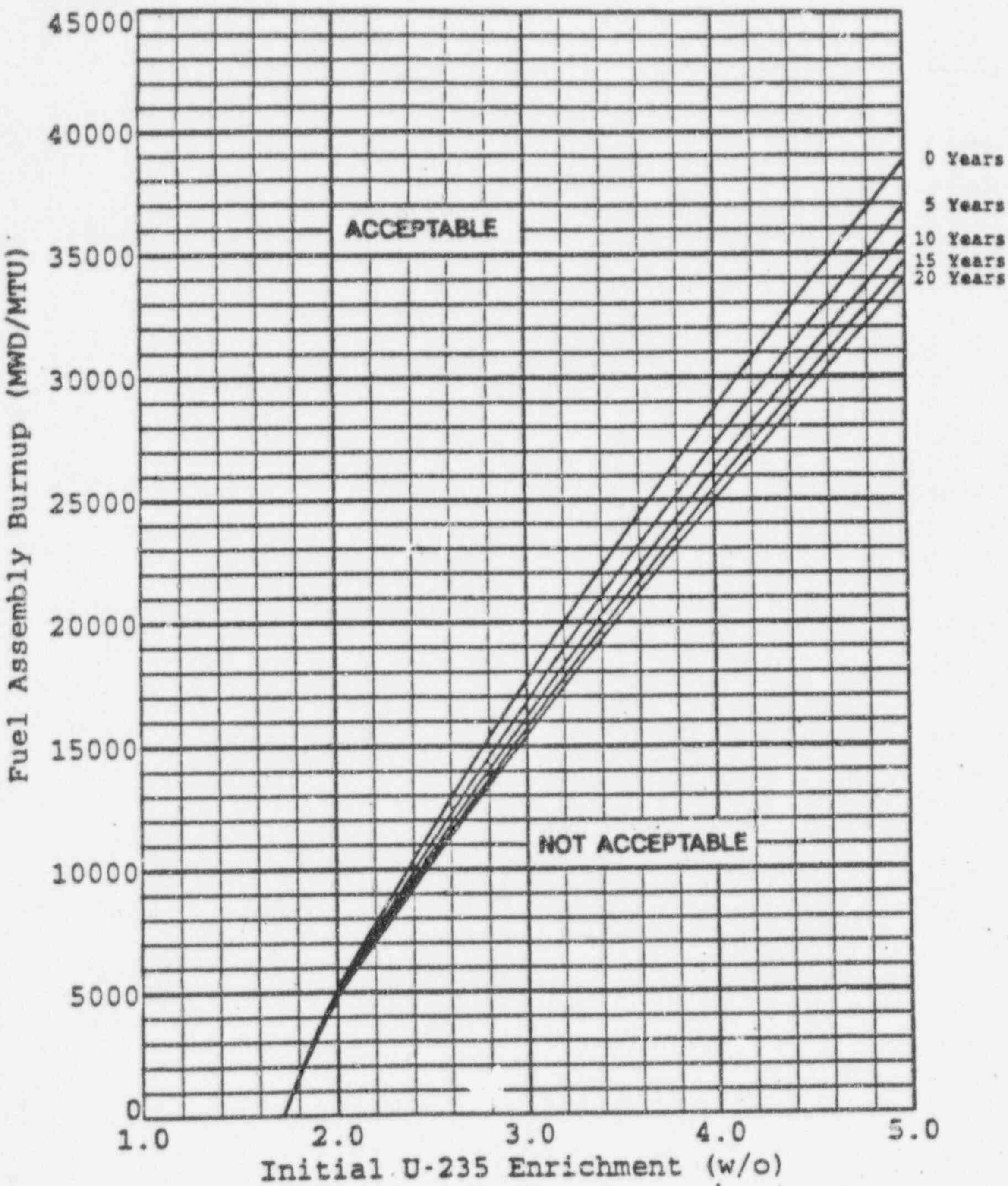
TS.5.6-8 Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - STD Fuel, 8 GAD



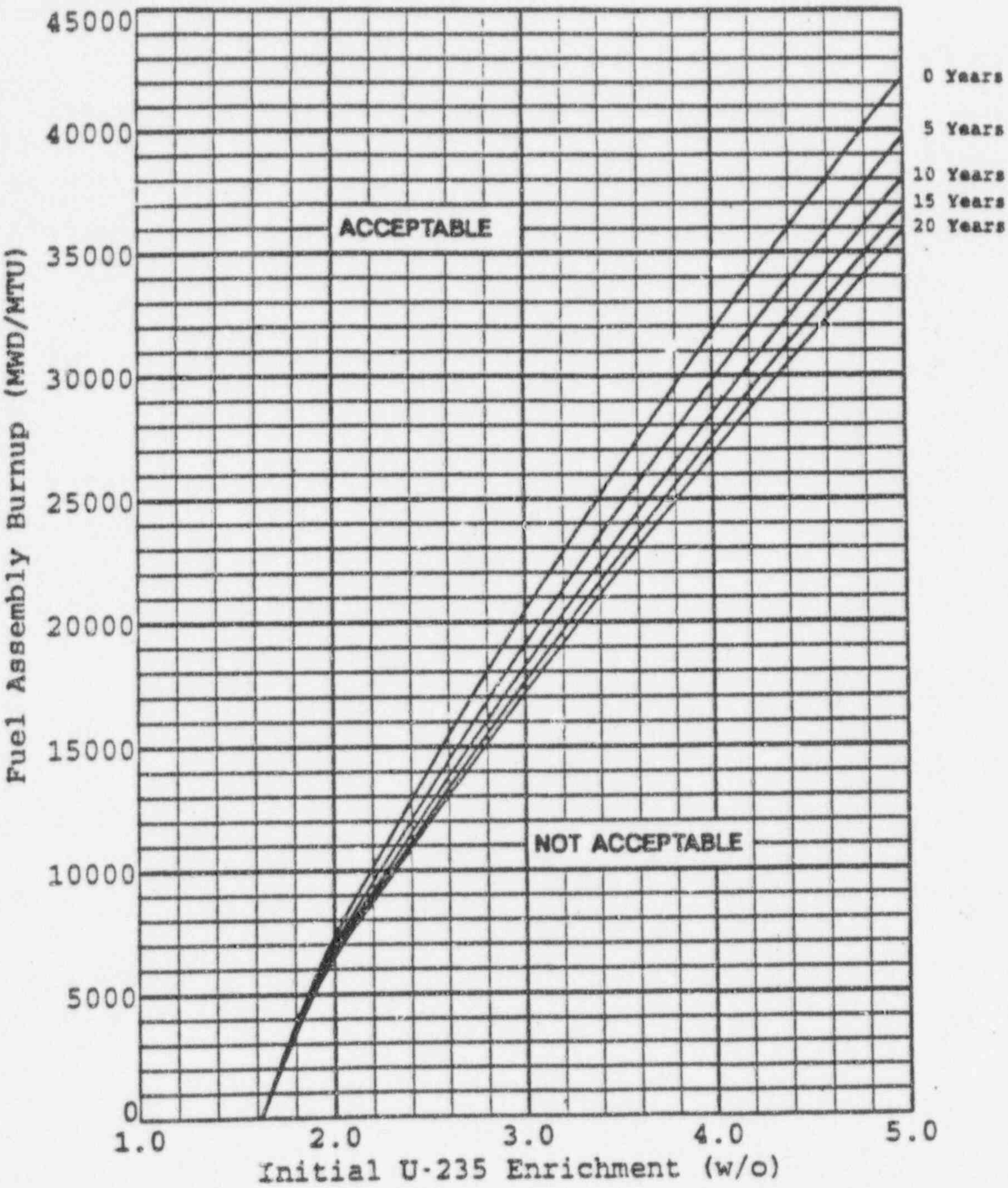
TS.5.6-9 Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - OFA Fuel, 12 GAD



TS.5.6-10 Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - STD Fuel, 12 GAD



TS.5.6-11 Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - OFA Fuel, 16 or More GAD



TS.5.6-12 Spent Fuel Pool Checkerboard Region Burnup and Decay Time Requirements - STD Fuel, 16 or More GAD

3.8 REFUELING AND FUEL HANDLING

Bases continued

The Spent Fuel Pool Special Ventilation System (Reference 3) is a safeguards system which maintains a negative pressure in the spent fuel enclosure upon detection of high area radiation. The Spent Fuel Pool Normal Ventilation System is automatically isolated and exhaust air is drawn through filter modules containing a roughing filter, particulate filter, and a charcoal filter before discharge to the environment via one of the Shield Building exhaust stacks. Two completely redundant trains are provided. The exhaust fan and filter of each train are shared with the corresponding train of the Containment In-service Purge System. High efficiency particulate absolute (HEPA) filters are installed before the charcoal adsorbers to prevent clogging of the iodine adsorbers in each SFPSVS filter train. The charcoal adsorbers are installed to reduce the potential release of radioiodine to the environment.

During movement of irradiated fuel assemblies or control rods, a water level of 23 feet is maintained to provide sufficient shielding.

The water level may be lowered to the top of the RCCA drive shafts for latching and unlatching. The water level may also be lowered below 20 feet for upper internals removal/replacement. The basis for these allowance(s) are (1) the refueling cavity pool has sufficient level to allow time to initiate repairs or emergency procedures to cool the core, (2) during latching/unlatching and upper internals removal/replacement the level is closely monitored because the activity uses this level as a reference point, (3) the time spent at this level is minimal.

The Prairie Island spent fuel storage racks have been analyzed (Reference 8) in accordance with the methodology contained in Reference 5. That methodology ensures that the spent fuel rack multiplication factor, K_{eff}, is less than 0.95 as recommended by ANSI 57.2-1983 (Reference 6) and NRC guidance (Reference 7). The codes, methods and techniques contained in the methodology are used to satisfy this criterion on K_{eff}. The resulting Prairie Island spent fuel rack criticality analysis allows for the storage of fuel assemblies with enrichments up to a maximum of 5.0 weight percent U-235 while maintaining $K_{eff} \leq 0.95$ including uncertainties and credit for soluble boron. In addition, sub-criticality of the pool ($K_{eff} < 1.0$) is assured on a 95/95 basis, without the presence of the soluble boron in the pool. Credit is taken for radioactive decay time of the spent fuel and for the presence of fuel rods containing Gadolinium burnable poison.

The Prairie Island specific criticality analysis (Reference 8) utilized the following storage configurations to ensure that the spent fuel pool will remain subcritical during the storage of fuel assemblies with all possible combinations of burnup and initial enrichment:

3.8 REFUELING AND FUEL HANDLING

Bases continued

1. The first storage configuration utilizes a checkerboard loading pattern to accommodate new or low burnup fuel with a maximum enrichment of 5.0 wt% U-235. This configuration stores "burned" and "fresh" fuel assemblies in a 3x3 checkerboard pattern as shown in Figure TS.5.6-1. Fuel assemblies stored in "burned" cell locations are selected based on a combination of fuel assembly type, initial enrichment, discharge burnup and decay time (Figures TS.5.6-3 through TS.5.6-12). The criteria for the fuel stored in the "burned" locations is also dependent on the number of rods containing Gadolinium in the center "fresh" fuel assembly. The use of empty cells is also an acceptable option for the "burned" cell locations. This will allow the storage of new or low burnup fuel assemblies in the outer rows of the spent fuel storage racks because the area outside the racks can be considered to be empty cells.

   Fuel assemblies that fall into the restricted range of Figures TS.3.8-1 or TS.3.8-2 are required to be stored in "fresh" cell locations as shown in Figure TS.5.6-1. The criteria included in Figures TS.3.8-1 and TS.3.8-2 for the selection of fuel assemblies to be stored in the "fresh" cell locations is based on a combination of fuel assembly type, initial enrichment, decay time and discharge burnup.

2. The second storage configuration does not utilize any special loading pattern. Fuel assemblies with burnup, initial enrichment and decay time which fall into the unrestricted range of Figures TS.3.8-1 or TS.3.8-2, as applicable, can be stored anywhere in the region with no special placement restrictions.

The burned/fresh fuel checkerboard region can be positioned anywhere within the spent fuel racks, but the boundary between the checkerboard region and the unrestricted region must be either:

1. separated by a vacant row of cells, or

2. the interface must be configured such that there is one row carryover of the pattern of burned assemblies from the checkerboard region into the first row of the unrestricted region (Figure TS.5.6-2).

Specifications 3.8.E.1, 5.6.A.1.d and 5.6.A.1.e ensure that fuel is stored in the spent fuel racks in accordance with the storage configurations assumed in the Prairie Island spent fuel rack criticality analysis (Reference 8).

The Prairie Island spent fuel pool criticality analysis addresses all the fuel types currently stored in the spent fuel pool and in use in the reactor. The fuel types considered in the analysis include the Westinghouse Standard (STD), OFA, and Vantage Plus designs, and the Exxon fuel assembly types in storage in the Prairie Island spent fuel pool. The OFA designation on the figures in Sections 3.8 and 5.6.A bound all of the Westinghouse OFA and Vantage Plus fuel assemblies at Prairie Island. The STD designation on the figures in Sections 3.8 and 5.6.A bound all of the Westinghouse STD and Exxon fuel assemblies at Prairie Island.

Bases continued

Most accident conditions in the spent fuel pool will not result in an increase in K_{eff} of the racks in either of the two storage configurations. Examples of those accident conditions which will not result in an increase in K_{eff} are a fuel assembly drop on the top of the racks, a fuel assembly drop between rack modules and wall (rack design precludes this condition), and a drop or placement of a fuel assembly into the cask loading area of the small pool. However, two accidents can be postulated which could increase reactivity. The first postulated accident would be a loss of the fuel pool cooling system and the second would be a misload of a fuel assembly into a cell for which the restrictions on location, enrichment, burnup, decay time or Gadolinium credit are not satisfied.

For an occurrence of these postulated accident conditions, the double contingency principle of ANSI/ANS-8.1-1983 can be applied. This states that one is not required to assume two unlikely, independent, concurrent events to ensure protection against a criticality accident. Thus, for these postulated accident conditions, the presence of additional soluble boron in the spent fuel pool water (above the 750 ppm required to maintain K_{eff} less than 0.95 under normal conditions) can be assumed as a realistic initial condition since not assuming its presence would be a second unlikely event.

Calculations were performed (Reference 8) to determine the amount of soluble boron requi[illegible]d to offset the highest reactivity increase caused by either of these postulated accidents and to maintain K_{eff} less than or equal to 0.95. It was found that a spent fuel pool boron concentration of 1300 ppm was adequate to mitigate these postulated criticality related accidents and to maintain K_{eff} less than or equal to 0.95. Specification 3.8.E.2 ensures the spent fuel pool contains adequate dissolved boron to compensate for the increased reactivity caused by a mispositioned fuel assembly or a loss of spent fuel pool cooling. The 1800 ppm spent fuel pool boron concentration limit in Specification 3.8.E.2 was chosen to be consistent with the boron concentration limit required by Specification 3.8.B.1.c for a spent fuel cask containing fuel.

Specification 5.6.A.1.c requires that the spent fuel rack K_{eff} be less than or equal to 0.95 when flooded with water borated to 750 ppm. A spent fuel pool boron dilution analysis was performed which confirmed that sufficient time is available to detect and mitigate a dilution of the spent fuel pool before the 0.95 K_{eff} design basis is exceeded. The spent fuel pool boron dilution analysis concluded that an unplanned or inadvertent event which could result in the dilution of the spent fuel pool boron concentration from 1800 ppm to 750 ppm is not a credible event.

When the requirements of Specification 3.8.E.1.a are not met, immediate action must be taken to move any non complying fuel assembly to an acceptable location to preserve the double contingency principle assumption of the criticality accident analysis.

3.8 REFUELING AND FUEL HANDLING

Bases continued

When the concentration of boron in the spent fuel pool is less than required by Specification 3.8.E.2.a, immediate action must be taken to preclude the occurrence of an accident or to mitigate the consequences of an accident in progress. This is most efficiently achieved by immediately suspending the movement of fuel assemblies. The concentration of boron is restored simultaneously with suspending movement of fuel assemblies. The suspension of fuel movement is not intended to preclude movement of a fuel assembly to a safe position.

References

1. USAR, Section 10.2.1.2
2. USAR, Section 14.5.1
3. USAR, Section 10.3.7
4. "Criticality Analysis of the Prairie Island Units 1 & 2 Fresh and Spent Fuel Racks", Westinghouse Commercial Nuclear Fuel Division, February 1993.
5. WCAP-14416-NP-A, "Westinghouse Spent Fuel Rack Criticality Analysis Methodology", Revision 1, November 1996.
6. American Nuclear Society, "American National Standard Design Requirements for Light Water Reactor Fuel Storage Facilities at Nuclear Power Plants", ANSI/ANS-57.2-1983, October 7, 1983.
7. Nuclear Regulatory Commission, Letter to All Power Reactor Licensees from B. K. Grimes, "OT Position for Review and Acceptance of Spent Fuel Storage and Handling Applications", April 14, 1978.
8. "Northern States Power Prairie Island Units 1 and 2 Spent Fuel Rack Criticality Analysis Using Soluble Boron Credit", Westinghouse Commercial Nuclear Fuel Division, February 1997.

4.20 Spent Fuel Pool Storage Configuration

Bases

This surveillance verifies that the fuel assemblies in the spent fuel storage racks are stored in accordance with the requirements of Specifications 3.8.E.1, 5.6.A.1.d and 5.6.A.1.e.

The surveillance is required to be completed within 7 days after the completion of any fuel handling campaign which involves the relocation of fuel assemblies within the spent fuel pool or the addition of fuel assemblies to the spent fuel pool. The extent of a fuel handling campaign will be defined by plant administrative procedures. Examples of a fuel handling campaign would include all of the fuel handling performed during a refueling outage or associated with the placement of new fuel into the spent fuel pool.

It is not the intent of this surveillance to require the completion of a spent fuel pool inventory verification during interruptions in fuel handling during a defined fuel handling campaign. No spent fuel pool inventory verification is required following fuel movements where no fuel assemblies are relocated to different spent fuel rack locations.

The 7 day allowance for completion of this surveillance provides adequate time for the completion of a spent fuel pool inventory verification while minimizing the time a fuel assembly may be misloaded in the spent fuel pool. If a fuel assembly is misloaded during a fuel handling campaign, the minimum boron concentration required by Specification 3.8.E.2 will ensure that the spent fuel rack K_{eff} remains within limits until the spent fuel pool inventory verification is performed.