Exhibit B

Prairie Island Nuclear Generating Plant

License Amendment Request Dated June 11, 1993

Proposed Changes Marked Up
On Existing Technical Specification Pages

Exhibit B consists of existing and new Technical Specification pages with the proposed changes highlighted on those pages. The existing and new pages affected by this License Amendment Request are listed below:

TS-iii
TS-vii
TS-xiii
TS.3.3-1
TS.3.8-4
TS.3.8-5
Figure TS.3.8-1
Table TS.4.1-2B (Page 1 of 2)
Table TS.4.1-2B (Page 2 of 2)
TS.5.3-1
TS.5.6-1
TS.5.6-2
TS.5.6-3
Figure TS.5.6-1
Figure TS.5.6-2
B.3.8-2
B.3.8-3
B.3.8-4

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TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

APPENDIX A TECHNICAL SPECIFICATIONS

LIST OF FIGURES

3.3 ENGINEERED SAFETY FEATURES

Applicability

Applies to the operating status of the engineered safety features.

Objective

To define those limiting conditions that are necessary for operation of engineered safety features: (1) to remove decay heat from the core in an emergency or normal shutdown situations, and (2) to remove heat from containment in normal operating and emergency situations.

Specifications

A. Safety Injection and Residual Heat Removal Systems

1. A reactor shall not be made or maintained critical nor shall reactor coolant system average temperature exceed 200°F unless the following conditions are satisfied (except as specified in 3.3.A.2 below):

   a. The refueling water tank contains not less than 200,000 gallons of water with a boron concentration of at least ~~1950~~ 2500 ppm.

   b. Each reactor coolant system accumulator shall be OPERABLE when reactor coolant system pressure is greater than 1000 psig.

      OPERABILITY require :
      (1) The isolation valve is open
      (2) Volume is 1270 ±20 cubic feet of borated water
      (3) A minimum boron concentration of 1900 ppm
      (4) A nitrogen cover pressure of 740 ± 30 psig

   c. Two safety injection pumps are OPERABLE except that pump control switches in the control room shall meet the requirements of Section 3.3.A.3, 3.3.A.4 and 3.1.A.1.d.(2) whenever the reactor coolant system temperature is less than 310°F*.

   d. Two residual heat removal pumps are OPERABLE.

   e. Two residual heat exchangers are OPERABLE.

*Valid until 20 EFPY

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. ~~Storage of Low Burnup Fuel~~

~~1. The following restrictions shall apply whenever fuel with an average assembly burnup less than 5,000 MWD/MTU is stored in the spent fuel pool (except as specified in 3.8.E.2 and 3.8.E.3 below):~~

~~a. The boron concentration in the spent fuel pool shall be maintained greater than or equal to 500 ppm, and~~

~~b. Fuel with an average assembly burnup less than 5,000 MWD/MTU shall not be stored in more than three storage locations of every two by two storage rack array.~~

~~2. If the conditions in 3.8.E.1.a above are not met, verify that the spent fuel pool storage configuration meets the requirements of specification 3.8.E.1.b and suspend all actions involving the movement of fuel in the spent fuel pool until the boron concentration is increased to 500 ppm or greater.~~

~~3. If the conditions in 3.8.E.1.b above are not met, suspend all actions involving movement of fuel in the spent fuel pool, verify the spent fuel pool boron concentration to be greater than or equal to 500 ppm and initiate corrective actions. Mis-positioned fuel assemblies shall be moved to acceptable locations prior to the resumption of other fuel movement in the spent fuel pool.~~

3.8.E. Spent Fuel Pool Storage

1. Fuel Assembly Storage

   a. To be stored without restriction in the spent fuel pool, the burnup and initial enrichment of a fuel assembly shall be within the unrestricted range of Figure TS.3.8-1.

   b. Fuel assemblies with a combination of burnup and initial enrichment in the restricted range of Figure TS.3.8-1 shall be stored in accordance with Specification 5.6.A.1.d.

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

   d. 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 with a combination of burnup and initial enrichment in the restricted range of Figure TS.3.8-1 are stored in the spent fuel pool and a spent fuel pool verification has not been performed since the last movement of any fuel assembly in the spent fuel pool.

   b. If the requirements of specification 3.8.E.2.a are applicable and the spent fuel pool boron concentration is not within its limit, then immediately:

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

      2. Either initiate action to restore spent fuel pool boron concentration to within its limit or perform a spent fuel pool verification.

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

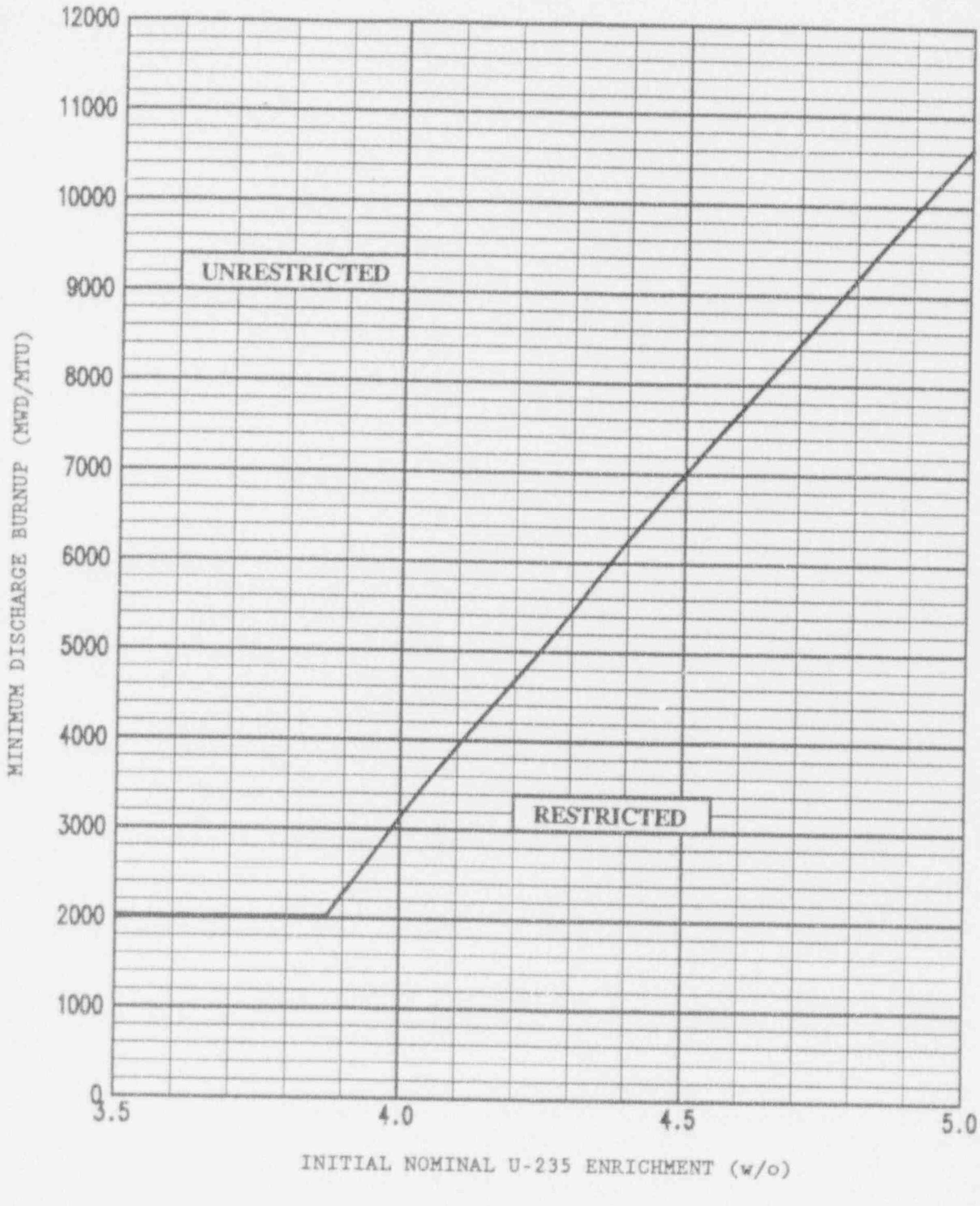


FIGURE TS.3.8-1 Spent Fuel Pool Unrestricted Region Minimum Burnup Requirements

TABLE TS.4.1-2B

MINIMUM FREQUENCIES FOR SAMPLING TESTS

TEST	FREQUENCY	FSAR Section Reference
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*, O2)	5/Week	
8. RCS Boron Concentration*(3)	2/Week (4)	9.2
9. RWST Boron Concentration	Weekly	
10. Boric Acid Tanks Boron Concentration	2/Week	
11. Caustic Standpipe NaOH Concentration	Monthly	6.4
12. Accumulator Boron Concentration	Monthly	6
13. Spent Fuel Pit Boron Concentration	Monthly/Weekly(7)(8)	9.5.5

TABLE TS.4.1-2B

MINIMUM FREQUENCIES FOR SAMPLING TESTS

TEST	FREQUENCY	FSAR Section Reference
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.

7. The minimum spent fuel pool boron concentration from Specification 3.8.B.1.b shall be verified by chemical analysis weekly while a spent fuel cask containing fuel is located in the spent fuel pool.

8. The spent fuel pool boron concentration shall be verified weekly, by chemical analysis, to be within the limits of Specification 3.8.E.2.a when fuel assemblies with a combination of burnup and initial enrichment in the restricted range of Figure TS.3.8-1 are stored in the spent fuel pool and a spent fuel pool verification has not been performed since the last movement of any fuel assembly in the spent fuel pool.

* See Specification 4.1.D

5.3 REACTOR

A. Reactor Core

1. The reactor core contains uranium in the form of natural or slightly enriched uranium dioxide pellets. The pellets are encapsulated in Zircaloy-4 or ZIRLO tubing to form fuel rods. The reactor core is made up of 121 fuel assemblies. Each fuel assembly contains 179 fuel rods (Reference 1).

2. The maximum enrichment will be ~~4.25~~ 5.0 weight percent U-235.

3. In the reactor core, there are 29 full-length RCC assemblies that contain a 142-inch length of silver-indium-cadmium alloy clad with stainless steel (Reference 2).

B. Reactor Coolant System

1. The design of the reactor coolant system complies with all applicable code requirements (Reference 3).

2. All high pressure piping, components of the reactor coolant system and their supporting structures are designed to Class I requirements, and have been designed to withstand:

   a. The design seismic ground acceleration, 0.06g acting in the horizontal and 0.04g acting in the vertical planes simultaneously, with stresses maintained within code allowable working stresses.

   b. The maximum potential seismic ground acceleration, 0.12g, acting in the horizontal and 0.08g acting in the vertical planes simultaneously with no loss of function.

3. The nominal liquid volume of the reactor coolant system, at rated operating conditions, is 6100 cubic feet.

C. Protection Systems

The protection systems for the reactor and engineered safety features are designed to applicable codes, including IEEE-279, dated 1968. The design includes a reactor trip for a high negative rate of change of neutron flux as measured by the excore nuclear instruments (Reference 4). The system is intended to trip the reactor upon the abnormal dropping of more than one control rod (Reference 4). If only one control rod is dropped, the core can be operated at full power for a short time, as permitted by Specification 3.10.

References

1. USAR, Section 3.4.2
2. USAR, Section 3.5.2
3. USAR, Table 4.1-11
4. USAR, Section 7.1

5.6 FUEL HANDLING

A. Criticality Consideration

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

~~The new and spent fuel storage racks are designed so that it is impossible to insert assemblies in other than the prescribed locations. The design of the new fuel storage pit and racks (Reference 1) ensures a new fuel pit K_{eff} of less than or equal to 0.95, including uncertainties, even if unborated water were used to fill the pit. The new fuel rack configuration also ensures K_{eff} less than or equal to 0.98, including uncertainties, even if the new fuel racks were accidentally filled with a low density moderator which resulted in optimum low density moderation conditions. Fuel stored in the new fuel storage racks will have a maximum enrichment of 4.25 weight percent U-235.~~

~~The spent fuel storage rack design (Reference 1) and the limitations on the storage of low burnup fuel contained in Technical Specification Section 3.8.E ensure a spent fuel pool K_{eff} of less than or equal to 0.95, including uncertainties. The maximum enrichment of fuel to be stored in the spent fuel pool will be 4.25 weight percent U-235.~~

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

   c. New or spent fuel assemblies with a combination of burnup and initial enrichment in the unrestricted range of Figure TS.3.8-1 allowed unrestricted storage in the spent fuel racks; and

   d. New or spent fuel assemblies with a combination of burnup and initial enrichment in the restricted range of Figure TS.3.8-1 stored in compliance with Figures TS.5.6-1 and TS.5.6-2.

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. <u>Spent Fuel Storage Structure</u>

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.

The spent fuel pool has a reinforced concrete bottom slab nearly 6 feet thick and has been designed to minimize loss of water due to a dropped cask accident. Piping to the pool is arranged so that failure of any pipe cannot drain the pool below the tops of the stored fuel assemblies.

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

The new and spent fuel storage racks are designed so that it is impossible to insert assemblies in other than the prescribed locations.

C. Fuel Handling

The fuel handling system provides the means of transporting and handling fuel from the time it reaches the plant in an unirradiated condition until it leaves after post-irradiation cooling. The system consists of the refueling cavity, the fuel transfer system, the spent fuel storage pit, and the spent fuel cask transfer system.

Major components of the fuel handling system are the manipulation crane, the spent fuel pool bridge, the auxiliary building crane, the fuel transfer system, the spent fuel storage racks, the spent fuel cask, and the rod cluster control changing fixture. The reactor vessel stud tensioner, the reactor vessel head lifting device, and the reactor internals lifting device are used for preparing the reactor for refueling and for assembling the reactor after refueling.

Upon arrival in the storage pit, spent fuel will be removed from the transfer system and placed, one assembly at a time, in storage racks using a long-handled manual tool suspended from the spent fuel pit bridge crane. After sufficient decay, the fuel will be loaded into storage casks for storage in the Independent Spent Fuel Storage Installation or into shipping casks for removal from the site. The casks will be handled by the auxiliary building crane.

Spent fuel casks will be handled by a single failure proof handling system meeting the requirements of Section 5.1.6 of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants", July 1980. The auxiliary building crane has been upgraded to conform with the single failure proof requirements of Section 5.1.6 of NUREG-0612. The auxiliary building crane is designed to not allow a load drop as a result of any single failure. The improved reliability of the auxiliary building crane is achieved through increased factors of safety and through redundancy or duality in certain active components.

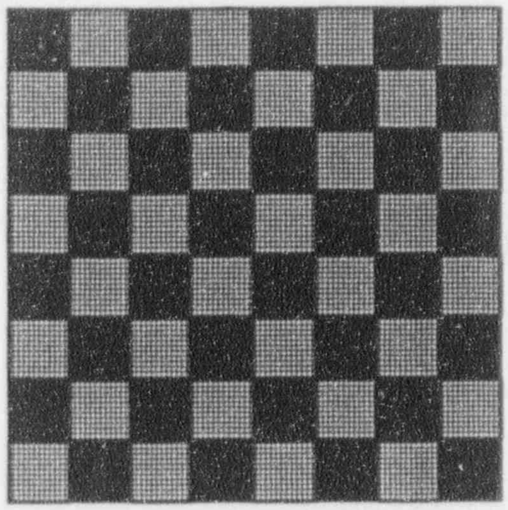
D. Spent Fuel Storage Capacity

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.

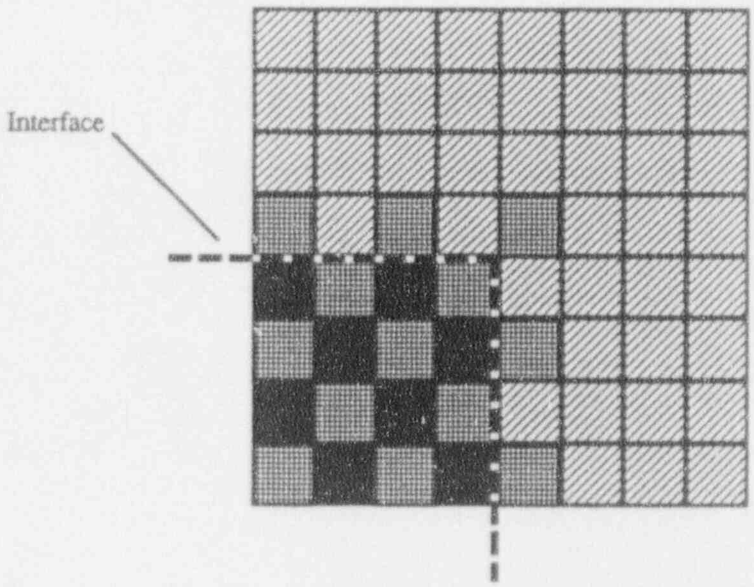
Reference

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.



PATTERN FOR CHECKERBOARD REGION



BOUNDARY BETWEEN CHECKERBOARD AND UNRESTRICTED REGIONS

Fresh Fuel:	Enrichments up to 5.0 w/o U-235, no restrictions on burnup
Checkerboard Region Burned Fuel:	Must satisfy minimum burnup requirements of Figure TS.5.6-2.
Unrestrcited Region Burned Fuel:	Must satisfy minimum burnup requirements of Figure TS.3.8-1.

Note: The Checkerboard and unrestricted regions can alternatively be separated by a single row of vacant cells on each adjacent face.

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

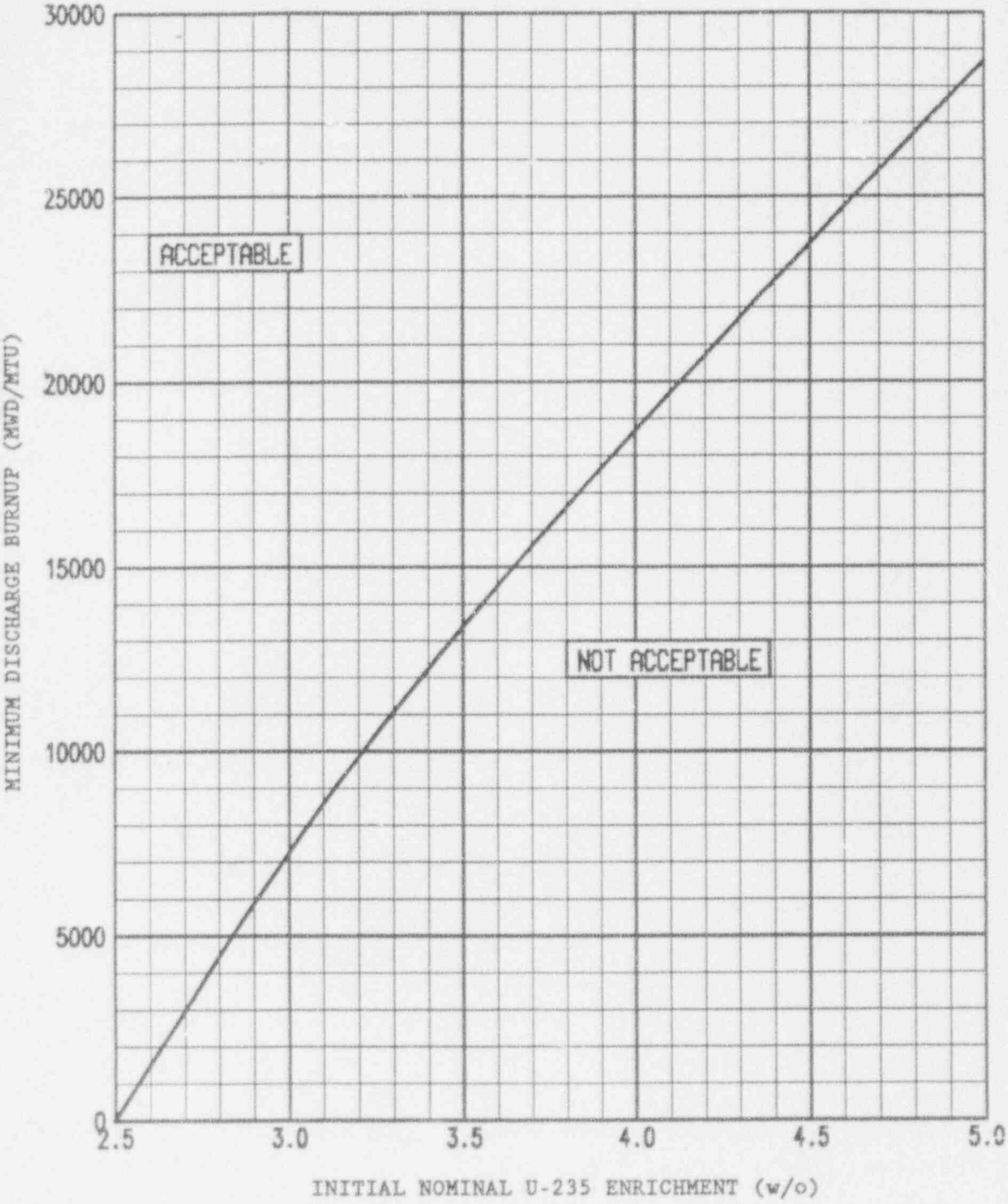


FIGURE TS.5.6-2 Spent Fuel Pool Checkerboard Region Minimum Burnup Requirements

3.8 REFUELING AND FUEL HANDLING

Bases continued

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 requirements for the storage of low burnup fuel in the spent fuel pool ensure that the spent fuel pool will remain subcritical during fuel storage. Fuel stored in the spent fuel pool will be limited to a maximum enrichment of 4.25 weight percent U-235. It has been shown by criticality analysis that the use of the three out of four storage configuration will assure that the K_{eff} will remain less than 0.95, including uncertainties, when fuel with a maximum enrichment of 4.25 weight percent U-235 and average assembly burnup of less than 5,000 MWD/MTU is stored in the spent fuel pool.~~

~~The requirement for maintaining the spent fuel pool boron concentration greater than 500 ppm whenever fuel with average assembly burnup of less than 5,000 MWD/MTU is stored in the spent fuel pool ensures that K_{eff} for the spent fuel pool will remain less than 0.95, including uncertainties, even if a fuel assembly is inadvertently inserted in the empty cell of the three out of four storage configuration.~~

The Prairie Island spent fuel storage racks have been analyzed (Reference 4) to allow for the storage of fuel assemblies with enrichments up to 5.0 weight percent U-235 while maintaining $K_{eff} \leq 0.95$ including uncertainties. This criticality analysis utilized the following storage configurations or regions 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:

1. The first region 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 2x2 checkerboard pattern. Fuel assemblies stored in "burned" cell locations must have an initial enrichment less than 2.5 wt% U-235 (nominal) or satisfy a minimum burnup requirement. The use of empty cells is also an acceptable option for the "burned" cell locations. Fuel assemblies stored in the "fresh" cell locations can have enrichments up to 5.0 wt% U-235 with no requirements for burnup or burnable absorbers.

2. The second region does not utilize any special loading pattern. Fuel assemblies with burnup and initial enrichments which fall into the unrestricted range of Figure TS.3.8-1 can be stored anywhere in the region with no special placement restrictions. Fuel assemblies which fall into the restricted range of Figure TS.3.8-1 must be stored in the checkerboard region in accordance with Specification 5.6.A.1.d.

3.8 REFUELING AND FUEL HANDLING

Bases continued

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.5.6-1).

Figure TS.3.8-1, which specifies the minimum burnup requirements for unrestricted storage in the spent fuel pool, is based on enrichments from 3.87 to 5.0 weight percent U-235. Enrichments lower than 3.87 weight percent are conservatively bounded by the minimum burnup requirement for 3.87 weight percent U-235 which is 2000 MWD/MTU. Therefore, Figure TS.3.8-1 has been drawn to require that fuel with an initial enrichment of less than 3.87 weight percent U-235 have 2000 MWD/MTU burnup or greater before unrestricted storage in the spent fuel pool will be allowed.

The water in the spent fuel pool normally contains soluble boron, which results in large subcriticality margins under actual operating conditions. However, the NRC guidelines, based upon the accident condition in which all soluble poison is assumed to have been lost, specify that the limiting k_{eff} of 0.95 be evaluated in the absence of soluble boron. Hence, the design of both regions is based on the use of unborated water, which ensures that each region is maintained in a subcritical condition during normal operation with the regions fully loaded.

Most accident conditions do not result in a significant increase in the activity of either of the two regions. Examples of these accident conditions are the loss of cooling, the dropping of a fuel assembly on the top of the rack, and the dropping of a fuel assembly between rack modules and wall (rack design precludes this condition). However, accidents can be postulated that could increase the reactivity. For these accident conditions, the double contingency principle of ANSI N16.1-1975 can be applied. This states that one is not required to assume two unlikely, independent, concurrent events to ensure protection against a criticality accident.

The double contingency principle allows credit for soluble boron under abnormal or accident conditions, since only a single accident need be considered at one time. For example, the most severe accident scenario is the accidental misloading of a fuel assembly into a rack location for which the restrictions on location, enrichment or burnup are not satisfied. This could potentially increase the reactivity in spent fuel racks. To mitigate these postulated criticality related accidents, Specification 3.8.E.2 ensures the spent fuel pool contains adequate dissolved boron anytime fuel assemblies with a combination of burnup and initial enrichment in the restricted range of Figure TS.3.8-1 are stored in the fuel pool and a spent fuel pool verification has not been performed since the last movement of any fuel assembly in the spent fuel pool. The negative reactivity effect of the soluble boron would compensate for the increased reactivity caused by a mispositioned fuel assembly.

3.8 REFUELING AND FUEL HANDLING

Bases continued

The boron concentration requirements of Specification 3.8.E.2 are no longer imposed when no fuel movements are occurring and a spent fuel pool verification has been completed, because the storage requirements of Specifications 3.8.E.1 and 5.6.A.1.d are then adequate to prevent criticality.

Specification 3.8.E.2.a is not imposed when only fuel assemblies with a combination of burnup and initial enrichment in the unrestricted range of Figure TS.3.8-1 are stored in the spent fuel pool. The requirements of Specification 3.8.E.2.a are not required in that case because with only fuel assemblies that have burnup and initial enrichment in the unrestricted range of Figure TS.3.8-1 it is not possible to cause an inadvertent criticality by mispositioning a fuel assembly in the spent fuel pool.

When the requirements of Specification 3.8.E.2.a are applicable, and the concentration of boron in the spent fuel pool is less than required, 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. An acceptable alternative is to complete a spent fuel pool verification. However, prior to resuming movement of fuel assemblies, the concentration of boron must be restored. This does not preclude movement of a fuel assembly to a safe position.

A spent fuel pool verification is required following the last movement of any fuel assembly in the spent fuel pool, if fuel assemblies with a combination of burnup and initial enrichment in the restricted range of Figure TS.3.8-1 are stored in the spent fuel pool. This verification will confirm that any fuel assemblies with a combination of burnup and initial enrichment in the restricted range of Figure TS.3.8-1 are stored in accordance with the requirements of Specification 5.6.A.1.d.

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.

Exhibit C

Prairie Island Nuclear Generating Plant

License Amendment Request Dated June 11, 1993

Revised Technical Specification Pages

Exhibit C consists of revised and new pages for the Prairie Island Nuclear Generating Plant Technical Specifications with the proposed changes incorporated. The revised and new pages are listed below:

TS-iii
TS-vii
TS-xiii
TS.3.3-1
TS.3.8-4
TS.3.8-5
Figure TS.3.8-1
Table TS.4.1-2B (Page 1 of 2)
Table TS.4.1-2B (Page 2 of 2)
TS.5.3-1
TS.5.6-1
TS.5.6-2
TS.5.6-3
Figure TS.5.6-1
Figure TS.5.6-2
B.3.8-2
B.3.8-3
B.3.8-4

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

APPENDIX A TECHNICAL SPECIFICATIONS

LIST OF FIGURES

3.3 ENGINEERED SAFETY FEATURES

Applicability

Applies to the operating status of the engineered safety features.

Objective

To define those limiting conditions that are necessary for operation of engineered safety features: (1) to remove decay heat from the core in an emergency or normal shutdown situations, and (2) to remove heat from containment in normal operating and emergency situations.

Specifications

A. Safety Injection and Residual Heat Removal Systems

1. A reactor shall not be made or maintained critical nor shall reactor coolant system average temperature exceed 200°F unless the following conditions are satisfied (except as specified in 3.3.A.2 below):

   a. The refueling water tank contains not less than 200,000 gallons of water with a boron concentration of at least 2500 ppm.

   b. Each reactor coolant system accumulator shall be OPERABLE when reactor coolant system pressure is greater than 1000 psig.

      OPERABILITY requires:
      (1) The isolation valve is open
      (2) Volume is 1270 ± 20 cubic feet of borated water
      (3) A minimum boron concentration of 1900 ppm
      (4) A nitrogen cover pressure of 740 ± 30 psig

   c. Two safety injection pumps are OPERABLE except that pump control switches in the control room shall meet the requirements of Section 3.3.A.3, 3.3.A.4 and 3.1.A.1.d.(2) whenever the reactor coolant system temperature is less than 310°F*.

   d. Two residual heat removal pumps are OPERABLE.

   e. Two residual heat exchangers are OPERABLE.

*Valid until 20 EFPY

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. To be stored without restriction in the spent fuel pool, the burnup and initial enrichment of a fuel assembly shall be within the unrestricted range of Figure TS.3.8-1.

   b. Fuel assemblies with a combination of burnup and initial enrichment in the restricted range of Figure TS.3.8-1 shall be stored in accordance with Specification 5.6.A.1.d.

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

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

3.8.E.2. Spent Fuel Pool Boron Concentration

a. The spent fuel pool boron concentration shall be ≥ 1,800 ppm when fuel assemblies with a combination of burnup and initial enrichment in the restricted range of Figure TS.3.8-1 are stored in the spent fuel pool and a spent fuel pool verification has not been performed since the last movement of fuel assembly in the spent fuel pool.

b. If the requirements of specification 3.8.E.2.a are applicable and the spent fuel pool boron concentration is not within its limit, then immediately:

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

2. Either initiate action to restore spent fuel pool boron concentration to within its limit or perform a spent fuel pool verification.

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

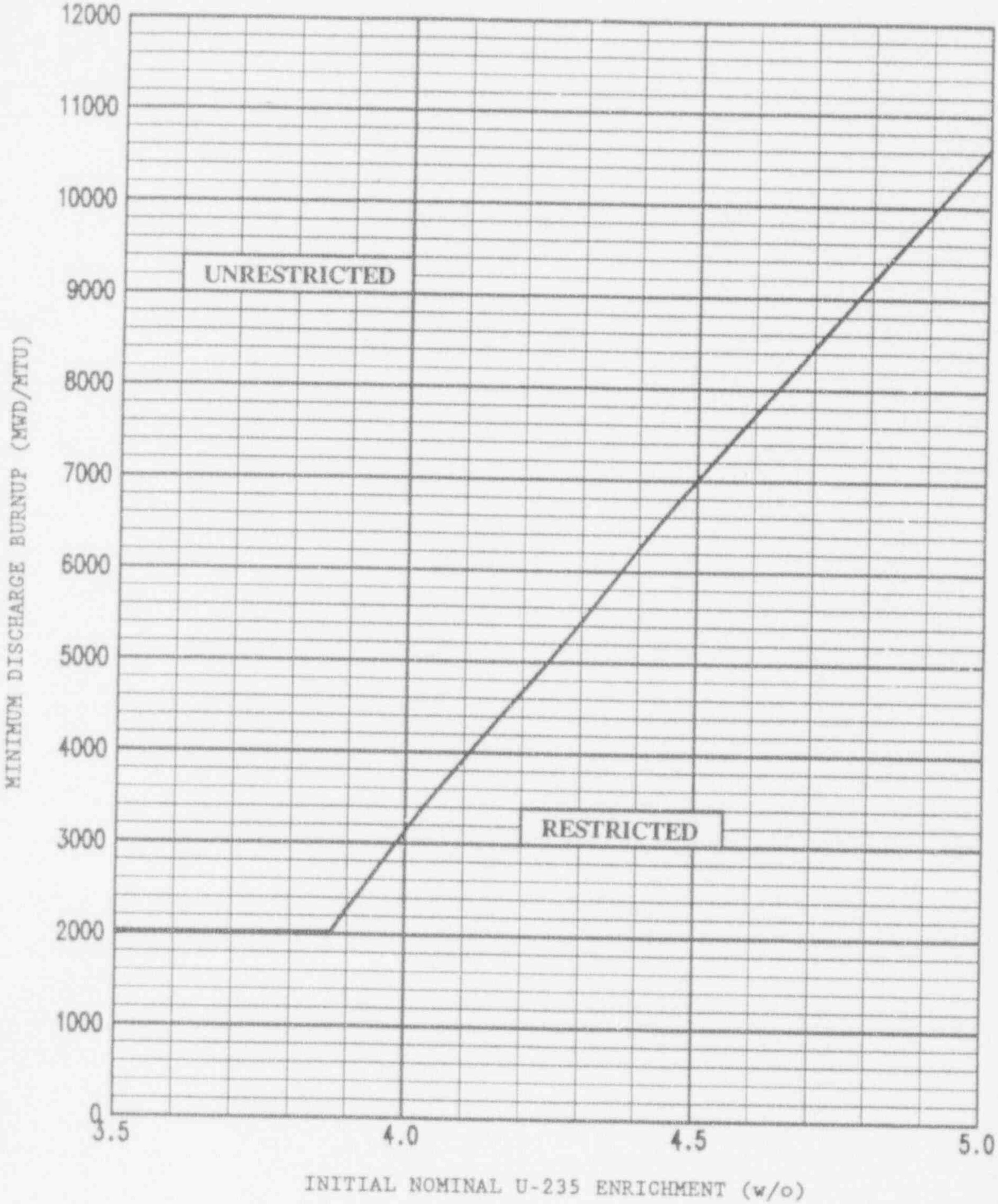


FIGURE TS.3.8-1 Spent Fuel Pool Unrestricted Region Minimum Burnup Requirements

TABLE TS.4.1-2B

MINIMUM FREQUENCIES FOR SAMPLING TESTS

TEST	FREQUENCY	FSAR Section Reference
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*, O2)	5/Week	
8. RCS Boron Concentration*(3)	2/Week (4)	9.2
9. RWST Boron Concentration	Weekly	
10. Boric Acid Tanks Boron Concentration	2/Week	
11. Caustic Standpipe NaOH Concentration	Monthly	6.4
12. Accumulator Boron Concentration	Monthly	6
13. Spent Fuel Pit Boron Concentration	Monthly/Weekly(7)(8)	9.5.5

TABLE TS.4.1-2B

MINIMUM FREQUENCIES FOR SAMPLING TESTS

TEST	FREQUENCY	FSAR Section Reference
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.

7. The minimum spent fuel pool boron concentration from Specification 3.8.B.1.b shall be verified by chemical analysis weekly while a spent fuel cask containing fuel is located in the spent fuel pool.

8. The spent fuel pool boron concentration shall be verified weekly, by chemical analysis, to be within the limits of Specification 3.8.E.2.a when fuel assemblies with a combination of burnup and initial enrichment in the restricted range of Figure TS.3.8-1 are stored in the spent fuel pool and a spent fuel pool verification has not been performed since the last movement of any fuel assembly in the spent fuel pool.

* See Specification 4.1.D

5.3 REACTOR

A. Reactor Core

1. The reactor core contains uranium in the form of natural or slightly enriched uranium dioxide pellets. The pellets are encapsulated in Zircaloy-4 or ZIRLO tubing to form fuel rods. The reactor core is made up of 121 fuel assemblies. Each fuel assembly contains 179 fuel rods (Reference 1).

2. The maximum enrichment will be 5.0 weight percent U-235.

3. In the reactor core, there are 29 full-length RCC assemblies that contain a 142-inch length of silver-indium-cadmium alloy clad with stainless steel (Reference 2).

B. Reactor Coolant System

1. The design of the reactor coolant system complies with all applicable code requirements (Reference 3).

2. All high pressure piping, components of the reactor coolant system and their supporting structures are designed to Class I requirements, and have been designed to withstand:

   a. The design seismic ground acceleration, 0.06g acting in the horizontal and 0.04g acting in the vertical planes simultaneously, with stresses maintained within code allowable working stresses.

   b. The maximum potential seismic ground acceleration, 0.12g, acting in the horizontal and 0.08g acting in the vertical planes simultaneously with no loss of function.

3. The nominal liquid volume of the reactor coolant system, at rated operating conditions, is 6100 cubic feet.

C. Protection Systems

The protection systems for the reactor and engineered safety features are designed to applicable codes, including IEEE-279, dated 1968. The design includes a reactor trip for a high negative rate of change of neutron flux as measured by the excore nuclear instruments (Reference 4). The system is intended to trip the reactor upon the abnormal dropping of more than one control rod (Reference 4). If only one control rod is dropped, the core can be operated at full power for a short time, as permitted by Specification 3.10.

References

1. USAR, Section 3.4.2
2. USAR, Section 3.5.2
3. USAR, Table 4.1-11
4. USAR, Section 7.1

5.6 FUEL HANDLING

A. <u>Criticality Consideration</u>

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

   c. New or spent fuel assemblies with a combination of burnup and initial enrichment in the unrestricted range of Figure TS.3.8-1 allowed unrestricted storage in the spent fuel racks; and

   d. New or spent fuel assemblies with a combination of burnup and initial enrichment in the restricted range of Figure TS.3.8-1 stored in compliance with Figures TS.5.6-1 and TS.5.6-2.

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

   c. $K_{eff} \le 0.98$ 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. <u>Spent Fuel Storage Structure</u>

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.

The spent fuel pool has a reinforced concrete bottom slab nearly 6 feet thick and has been designed to minimize loss of water due to a dropped cask accident. Piping to the pool is arranged so that failure of any pipe cannot drain the pool below the tops of the stored fuel assemblies.

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

The new and spent fuel storage racks are designed so that it is impossible to insert assemblies in other than the prescribed locations.

C. Fuel Handling

The fuel handling system provides the means of transporting and handling fuel from the time it reaches the plant in an unirradiated condition until it leaves after post-irradiation cooling. The system consists of the refueling cavity, the fuel transfer system, the spent fuel storage pit, and the spent fuel cask transfer system.

Major components of the fuel handling system are the manipulation crane, the spent fuel pool bridge, the auxiliary building crane, the fuel transfer system, the spent fuel storage racks, the spent fuel cask, and the rod cluster control changing fixture. The reactor vessel stud tensioner, the reactor vessel head lifting device, and the reactor internals lifting device are used for preparing the reactor for refueling and for assembling the reactor after refueling.

Upon arrival in the storage pit, spent fuel will be removed from the transfer system and placed, one assembly at a time, in storage racks using a long-handled manual tool suspended from the spent fuel pit bridge crane. After sufficient decay, the fuel will be loaded into storage casks for storage in the Independent Spent Fuel Storage Installation or into shipping casks for removal from the site. The casks will be handled by the auxiliary building crane.

Spent fuel casks will be handled by a single failure proof handling system meeting the requirements of Section 5.1.6 of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants", July 1980. The auxiliary building crane has been upgraded to conform with the single failure proof requirements of Section 5.1.6 of NUREG-0612. The auxiliary building crane is designed to not allow a load drop as a result of any single failure. The improved reliability of the auxiliary building crane is achieved through increased factors of safety and through redundancy or duality in certain active components.

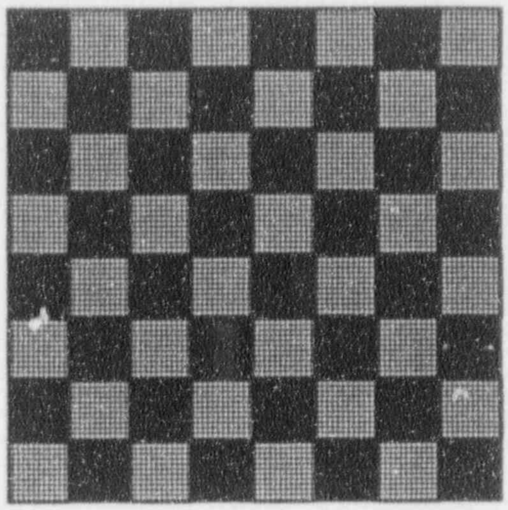
D. Spent Fuel Storage Capacity

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.

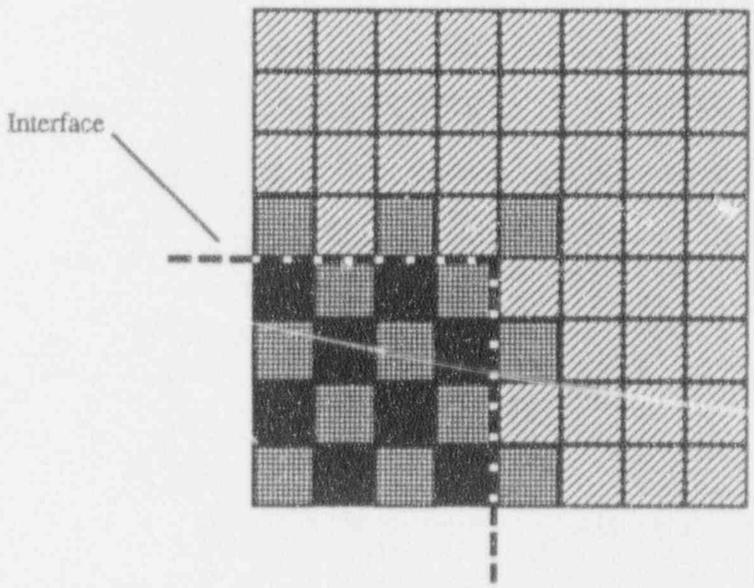
Reference

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.



PATTERN FOR CHECKERBOARD REGION



BOUNDARY BETWEEN CHECKERBOARD AND UNRESTRICTED REGIONS

Fresh Fuel: Enrichments up to 5.0 w/o U-235, no restrictions on burnup

Checkerboard Region Burned Fuel: Must satisfy minimum burnup requirements of Figure TS.5.6-2.

Unrestrcited Region Burned Fuel: Must satisfy minimum burnup requirements of Figure TS.3.8-1.

Note: The Checkerboard and unrestricted regions can alternatively be separated by a single row of vacant cells on each adjacent face.

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

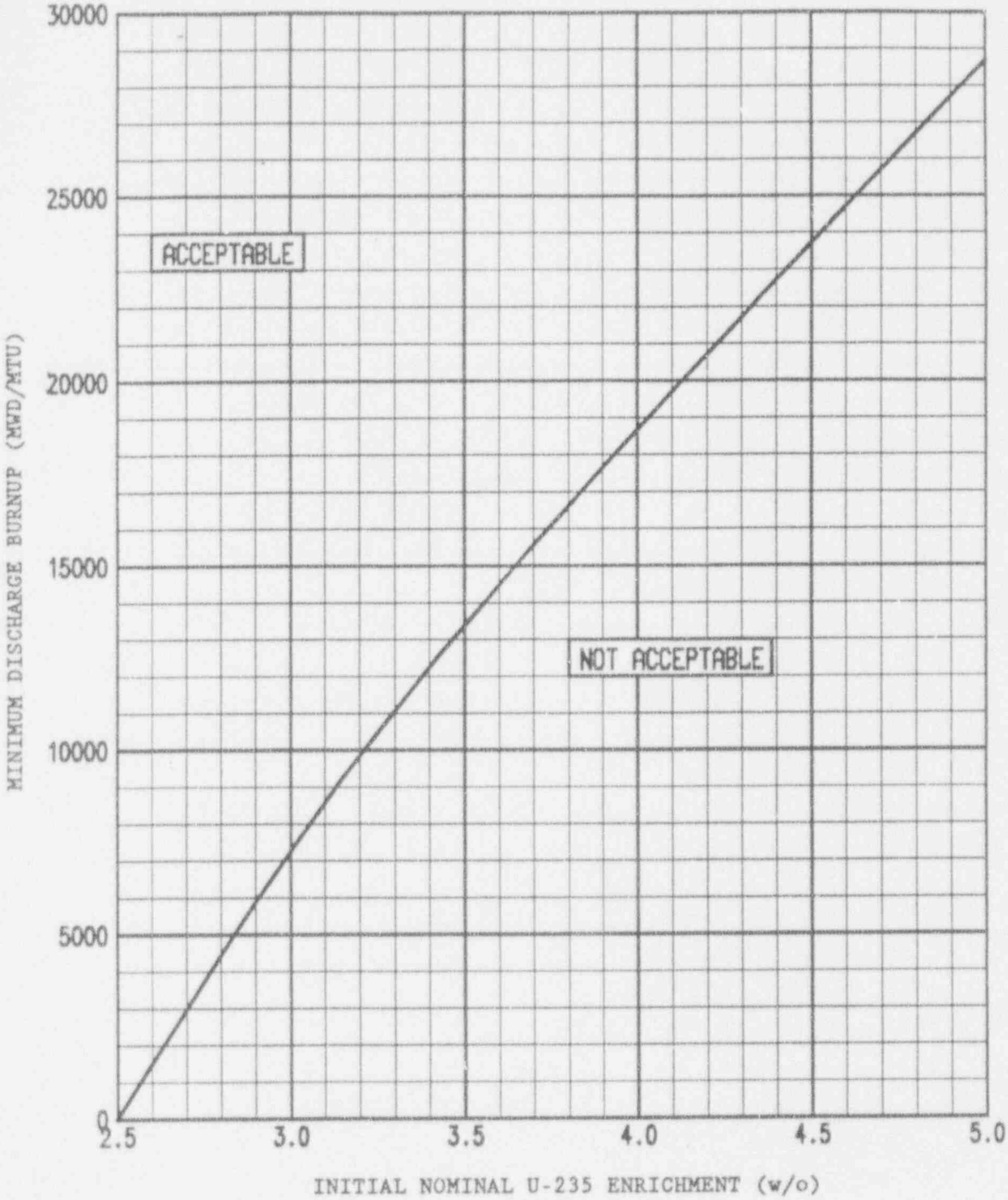


FIGURE TS.5.6-2 Spent Fuel Pool Checkerboard Region
Minimum Burnup Requirements

3.8 REFUELING AND FUEL HANDLING

Bases continued

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 4) to allow for the storage of fuel assemblies with enrichments up to 5.0 weight percent U-235 while maintaining $K_{eff} \leq 0.95$ including uncertainties. This criticality analysis utilized the following storage configurations or regions 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:

1. The first region 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 2x2 checkerboard pattern. Fuel assemblies stored in "burned" cell locations must have an initial enrichment less than 2.5 wt% U-235 (nominal) or satisfy a minimum burnup requirement. The use of empty cells is also an acceptable option for the "burned" cell locations. Fuel assemblies stored in the "fresh" cell locations can have enrichments up to 5.0 wt% U-235 with no requirements for burnup or burnable absorbers.

2. The second region does not utilize any special loading pattern. Fuel assemblies with burnup and initial enrichments which fall into the unrestricted range of Figure TS.3.8-1 can be stored anywhere in the region with no special placement restrictions. Fuel assemblies which fall into the restricted range of Figure TS.3.8-1 must be stored in the checkerboard region in accordance with Specification 5.6.A.1.d.

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.5.6-1).

3.8 REFUELING AND FUEL HANDLING

Bases continued

Figure TS.3.8-1, which specifies the minimum burnup requirements for unrestricted storage in the spent fuel pool, is based on enrichments from 3.87 to 5.0 weight percent U-235. Enrichments lower than 3.87 weight percent are conservatively bounded by the minimum burnup requirement for 3.87 weight percent U-235 which is 2000 MWD/MTU. Therefore, Figure TS.3.8-1 has been drawn to require that fuel with an initial enrichment of less than 3.87 weight percent U-235 have 2000 MWD/MTU burnup or greater before unrestricted storage in the spent fuel pool will be allowed.

The water in the spent fuel pool normally contains soluble boron, which results in large subcriticality margins under actual operating conditions. However, the NRC guidelines, based upon the accident condition in which all soluble poison is assumed to have been lost, specify that the limiting k_{eff} of 0.95 be evaluated in the absence of soluble boron. Hence, the design of both regions is based on the use of unborated water, which ensures that each region is maintained in a subcritical condition during normal operation with the regions fully loaded.

Most accident conditions do not result in a significant increase in the activity of either of the two regions. Examples of these accident conditions are the loss of cooling, the dropping of a fuel assembly on the top of the rack, and the dropping of a fuel assembly between rack modules and wall (rack design precludes this condition). However, accidents can be postulated that could increase the reactivity. For these accident conditions, the double contingency principle of ANSI N16.1-1975 can be applied. This states that one is not required to assume two unlikely, independent, concurrent events to ensure protection against a criticality accident.

The double contingency principle allows credit for soluble boron under abnormal or accident conditions, since only a single accident need be considered at one time. For example, the most severe accident scenario is the accidental misloading of a fuel assembly into a rack location for which the restrictions on location, enrichment or burnup are not satisfied. This could potentially increase the reactivity in spent fuel racks. To mitigate these postulated criticality related accidents, Specification 3.8.E.2 ensures the spent fuel pool contains adequate dissolved boron anytime fuel assemblies with a combination of burnup and initial enrichment in the restricted range of Figure TS.3.8-1 are stored in the fuel pool and a spent fuel pool verification has not been performed since the last movement of any fuel assembly in the spent fuel pool. The negative reactivity effect of the soluble boron would compensate for the increased reactivity caused by a mispositioned fuel assembly.

The boron concentration requirements of Specification 3.8.E.2 are no longer imposed when no fuel movements are occurring and a spent fuel pool verification has been completed, because the storage requirements of Specifications 3.8.E.1 and 5.6.A.1.d are then adequate to prevent criticality.

Specification 3.8.E.2.a is not imposed when only fuel assemblies with a combination of burnup and initial enrichment in the unrestricted range of Figure TS.3.8-1 are stored in the spent fuel pool. The requirements of Specification 3.8.E.2.a are not required in that case because with only fuel assemblies that have burnup and initial enrichment in the unrestricted range of Figure TS.3.8-1 it is not possible to cause an inadvertent criticality by mispositioning a fuel assembly in the spent fuel pool.

3.8 REFUELING AND FUEL HANDLING

Bases continued

When the requirements of Specification 3.8.E.2.a are applicable, and the concentration of boron in the spent fuel pool is less than required, 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. An acceptable alternative is to complete a spent fuel pool verification. However, prior to resuming movement of fuel assemblies, the concentration of boron must be restored. This does not preclude movement of a fuel assembly to a safe position.

A spent fuel pool verification is required following the last movement of fuel assemblies in the spent fuel pool, if fuel assemblies with a combination of burnup and initial enrichment in the restricted range of Figure TS.3.8-1 are stored in the spent fuel pool. This verification will confirm that any fuel assemblies with a combination of burnup and initial enrichment in the restricted range of Figure TS.3.8-1 are stored in accordance with the requirements of Specification 5.6.A.1.d.

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.

Exhibit D

Prairie Island Nuclear Generating Plant

License Amendment Request Dated June 11, 1993

Criticality Analysis
of Prairie Island Units 1 and 2
Fresh and Spent Fuel Racks

Prepared By
Westinghouse Commercial Nuclear Fuel Division

February 1993