SOUTHERN CALIFORNIA
EDISON
An EDISON INTERNATIONAL℠ Company

Dwight E. Nunn
Vice President

February 22, 2002

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Subject: **San Onofre Nuclear Generating Station Units 2 and 3**
Docket Nos. 50-361 and 50-362
Amendment Application Numbers 215 and 200
Proposed Change Number (PCN) 536
Request to Revise Technical Specifications to Create and Implement the Fuel Storage Program

Dear Sir or Madam:

Pursuant to 10CFR50.90, Southern California Edison (SCE) hereby requests Amendment Application Numbers 215 and 200, which consist of PCN 536. PCN 536 proposes to revise Technical Specifications 3.7.17, "Fuel Storage Pool Boron Concentration," 3.7.18, "Spent Fuel Assembly Storage," and 4.3, "Fuel Storage" and to create 5.5.2.16, "Fuel Storage Program." This proposed change will revise the minimum allowed boron concentration of the spent fuel pool and implement a fuel storage program to allow credit for soluble boron in place of Boraflex. Changes to the associated Bases are made for consistency and are included for information only. SCE has evaluated these requests under the standards set forth in 10 CFR 50.92(c) and determined that a finding of "no significant hazards consideration" is justified.

The requested approval date is the date SCE expects the results from the next regularly scheduled Boraflex coupon surveillance. Although SCE expects the coupon surveillance to yield satisfactory results, the implementation of these amendments requires a significant amount of fuel to be relocated to other spent fuel storage locations, as well as procedure changes and program implementation. Therefore, SCE requests approval of the proposed amendments by July 9, 2002, and that once approved, the amendments be implemented within 30 days of approval or July 9, 2002, whichever is later.

A001

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949-368-1480
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SCE is making no formal commitments that would derive from NRC approval of the proposed amendment.

If you have any questions or require additional information, please contact Mr. Jack Rainsberry at (949) 368 7420.

Sincerely,

Enclosures

1. Notarized Affidavits
2. Licensees Evaluation

Attachments

A. Existing Technical Specification Pages, Unit 2
B. Existing Technical Specification Pages, Unit 3
C. Proposed Technical Specification Pages, Redline and Strikeout, Unit 2
D. Proposed Technical Specification Pages, Redline and Strikeout, Unit 3
E. Proposed Technical Specification Pages, Unit 2
F. Proposed Technical Specification Pages, Unit 3
G. Proposed Bases Pages (For Information Only), Unit 2
H. Proposed Bases Pages (For Information Only), Unit 3
I. Proposed Fuel Storage Program
J. Spent Fuel Pool Dilution Analysis
K. Spent Fuel Pool Criticality Analysis

cc: E. W. Merschoff, Regional Administrator, NRC Region IV
C. C. Osterholtz, NRC Senior Resident Inspector, San Onofre Units 2 and 3
L. Raghavan, NRC Project Manager, San Onofre Units 2 and 3
S. Y. Hsu, Department of Health Services, Radiologic Health Branch

ENCLOSURE 1

NOTARIZED AFFIDAVITS

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

Application of SOUTHERN CALIFORNIA EDISON COMPANY, ET AL. for a Class 103 License to Acquire, Possess, and Use a Utilization Facility as Part of Unit No. 2 of the San Onofre Nuclear Generating Station	))))))	Docket No. 50-361 Amendment Application No. 215

SOUTHERN CALIFORNIA EDISON COMPANY et al., pursuant to 10 CFR 50.90, hereby submit Amendment Application No. 215. This amendment application consists of proposed change No. NPF-10-536 to Facility Operating License NPF-10. Proposed change No. NPF-10-536 is a request to revise Technical Specification 3.7.17, "Fuel Storage Pool Boron Concentration," 3.7.18, "Spent Fuel Assembly Storage," and 4.3, "Fuel Storage," and to create 5.5.2.16, "Fuel Storage Program." This proposed change will revise the minimum allowed boron concentration of the spent fuel pool and implement a Fuel Storage Program to allow credit for soluble boron in place of Boraflex.

State of California
County of San Diego

Subscribed and sworn to (or affirmed) before me this 22nd day of

February, 2002.

By: [signature]
Dwight E. Nunn
Vice President

[signature]
Notary Public

MARIANE SANCHEZ
Commission #1196482
Notary Public - California
San Diego County
My Comm. Expires Oct 14, 2002

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

Application of SOUTHERN CALIFORNIA EDISON COMPANY, ET AL. for a Class 103 License to Acquire, Possess, and Use a Utilization Facility as Part of Unit No. 3 of the San Onofre Nuclear Generating Station	))))))	Docket No. 50-362 Amendment Application No. 200

SOUTHERN CALIFORNIA EDISON COMPANY et al., pursuant to 10 CFR 50.90, hereby submit Amendment Application No. 200. This amendment application consists of proposed change No. NPF-15-536 to Facility Operating License NPF-15. Proposed change No. NPF-15-536 is a request to revise Technical Specification 3.7.17, "Fuel Storage Pool Boron Concentration," 3.7.18, "Spent Fuel Assembly Storage," and 4.3, "Fuel Storage," and to create 5.5.2.16, "Fuel Storage Program." This proposed change will revise the minimum allowed boron concentration of the spent fuel pool and implement a Fuel Storage Program to allow credit for soluble boron in place of Boraflex.

State of California
County of San Diego

Subscribed and sworn to (or affirmed) before me this 22nd day of February, 2002.

By: [signature]
Dwight E. Nunn
Vice President

[signature]
Notary Public

MARIANE SANCHEZ
Commission #1196482
Notary Public - California
San Diego County
My Comm. Expires Oct 14, 2002

Enclosure 2

LICENSEE'S EVALUATION

PCN 536

SPENT FUEL POOL STORAGE WITH NO BORAFLEX AND CREDIT FOR SOLUBLE BORON SAN ONOFRE NUCLEAR GENERATING STATION, UNITS 2 AND 3

1.0 INTRODUCTION

The proposed changes would revise the Technical Specification (TS) requirements for spent fuel storage to remove credit for use of Boraflex, to take credit for soluble boron, to increase the required concentration of soluble boron, and to create a Technical Specification to control the Fuel Storage Program.

This is a request to revise the following San Onofre Nuclear Generating Station (SONGS) Units 2 and 3 Technical Specifications:

Section 3.7.17, "Fuel Storage Pool Boron Concentration"
Section 3.7.18, "Spent Fuel Assembly Storage"
Section 4.3, "Fuel Storage"
Section 5.5.2.16, "Fuel Storage Program" (New)

2.0 PROPOSED CHANGE

TS 3.7.17 Fuel Storage Pool Boron Concentration

LCO 3.7.17 is revised to increase the minimum boron concentration from 1,850 to 2,000 parts per million (ppm). The frequency of verification (7 days) is not changed. Currently, soluble boron is not credited in determining fuel storage requirements used to maintain K_{eff}. However, with the anticipated loss of Boraflex a minimum concentration of soluble boron will be required to maintain K_{eff} to $\leq$ 0.95. The increase in the TS required concentration from 1,850 to 2,000 ppm ensures that there is no credible boron dilution event that would cause K_{eff} to exceed 0.95. A final boron concentration of 970 ppm following a boron dilution accident would be acceptable. Conservatively, SCE has established a limit for final boron concentration following a boron dilution accident of 1,700 ppm. The difference between 970 ppm (required for $K_{eff} \leq$ 0.95, non-accident conditions) and 1,700 ppm (assumed in the boron dilution analysis) is discretionary margin. To support the stricter controls being implemented by proposed TS 3.7.18, the applicability of TS 3.7.17 is being expanded to whenever a fuel assembly is stored in the fuel storage pool, and as a result Action A.2.2 is no longer applicable and is being deleted.

TS 3.7.18 Spent Fuel Assembly Storage

LCO 3.7.18 is completely revised, and Figures 3.7.18-1 and 3.7.18-2 are deleted. Specific storage requirements for SONGS Units 1, 2, and 3 fuel assemblies stored in Units 2 and 3 Spent Fuel Pools (SFP) are deleted and replaced with reference to Technical Specification Section 5.5.2.16, "Fuel Storage Program."

Currently the Boraflex in the SFP racks limits K_{eff} to $\leq$ 0.95 with minimal limitations on fuel assembly initial enrichment and burnup storage location criteria. The anticipated future loss of Boraflex requires additional storage requirements, which are more stringent than those currently in place. A Fuel Storage Program placed in Section 5.0 "Administrative Controls" best serves to control these requirements.

TS 4.3.1 Criticality

Sub-section 4.3.1.1, is revised as follows.

Item (a) is revised to clarify that the maximum U-235 enrichment of 4.80 weight percent is a NOMINAL value. Fabrication uncertainties are explicitly accounted for in the criticality analysis.

Items (b) through (i) are deleted and replaced with new items (b) through (f).

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

(c) $k_{eff} \leq 0.95$ if fully flooded with water borated to 1700 ppm, which includes an allowance for uncertainties as described in Section 9.1 of the UFSAR;

(d) A nominal 8.85 inch center to center distance between fuel assemblies placed in Region II;

(e) A nominal 10.40 inch center to center distance between fuel assemblies placed in Region I; and

(f) Units 1, 2, and 3 fuel assemblies shall be stored in accordance with Technical Specification 5.5.2.16, "Fuel Storage Program."

Items (b) and (c) above incorporate new K_{eff} requirements to be implemented as a result of the anticipated loss of Boraflex. Items (d) and (e) above are identical to the current requirements of TS 4.3.1(c) and 4.3.1(d). Item (f) above provides a reference to the proposed TS 5.5.2.16, "Fuel Storage Program," which contains expanded fuel storage requirements which will replace current TSs 4.3.1(e), 4.3.1(f), 4.3.1(g), 4.3.1(h), and 4.3.1(i).

TS 5.5.2.16 Fuel Storage Program

This Section creates the requirement to maintain and implement a Fuel Storage Program. The program must be approved by the NRC, and is included in this PCN as Attachment I, for review and approval.

Changes To TS Bases (included for information only)

Changes to the Bases of TS 3.7.17 and TS 3.7.18 are made for consistency with the proposed changes described above. They are provided in Attachments G and H for information only.

3.0 BACKGROUND

The spent fuel storage racks at San Onofre Nuclear Generating Station (SONGS) Units 2 and 3 consist of two storage regions. Region I is generally reserved for temporary storage of new fuel or partially irradiated fuel which does not qualify for Region II storage. Region II is generally used for normal, long term storage of permanently discharged fuel that has achieved qualifying burnup levels. As originally installed and currently licensed, both regions use Boraflex, a neutron absorbing material. Boraflex consists of fine boron carbide particles distributed in a polymeric silicone encapsulant.

The spent fuel storage racks at SONGS Units 2 and 3 are licensed to store two fuel assembly types:

(1) 16x16, Zircaloy cladding, Combustion Engineering fuel assemblies with a maximum nominal enrichment of up to 4.80 w/o

(2) 14x14, Stainless Steel cladding, Westinghouse fuel assemblies (transhipped from Unit 1) with a maximum nominal enrichment of up to 4.00 w/o

Erosion/dissolution of Boraflex in Pressurized Water Reactor (PWR) spent fuel pool racks is an industry-wide problem. Silica levels (an indicator of Boraflex dissolution) have been increasing in the SONGS Units 2 and 3 spent fuel pools and are currently about 6 ppm.

Although there is currently sufficient Boraflex, the spent fuel storage rack criticality analyses have been redone assuming no Boraflex. Assuming no Boraflex for SONGS Units 2 and 3 will totally eliminate any Boraflex concerns in the future, and monitoring programs will not be needed to ensure that an adequate amount of Boraflex is always present.

Consistent with other applications approved by the NRC, Southern California Edison (SCE) proposes to take credit for soluble boron in the spent fuel pool water.

4.0 TECHNICAL ANALYSIS

The results of criticality, boron dilution, radiological, decay heat, and structural/seismic analyses show that SONGS Units 1, 2, and 3 fuel assemblies can be safely stored in the SONGS Units 2 and 3 spent fuel racks assuming no Boraflex is present and taking credit for soluble boron.

The maximum nominal fresh enrichment of SONGS Units 2 and 3 fuel assemblies is 4.8 w/o. The SONGS Units 2 and 3 fuel assemblies are 16x16 and have zircaloy cladding.

The maximum nominal fresh enrichment of SONGS Unit 1 fuel assemblies is 4.0 w/o. The SONGS Unit 1 fuel assemblies are 14x14 and have stainless steel cladding.

Assuming no Boraflex, fuel storage patterns have been identified and analyzed in the criticality report (Attachment K) such that:

(1) Under normal conditions, the neutron multiplication factor, K_{eff}, is less than 1.0, including all uncertainties (95/95 probability/confidence level), when the storage racks are flooded with unborated water.

(2) Under normal conditions, the neutron multiplication factor, K_{eff}, is less than 0.95, including all uncertainties (95/95 probability/confidence level), when the storage racks are flooded with borated water at 970 ppm.

(3) Under accident conditions, the neutron multiplication factor, K_{eff}, is less than or equal to 0.95, including all uncertainties (95/95 probabilty/confidence level), when the storage racks are flooded with borated water at 1,700 ppm.

Assuming 2,000 ppm soluble boron in the spent fuel pool water, a boron dilution analysis (Attachment J) shows that it is not credible for the soluble boron concentration to fall below 1,700 ppm.

One-thousand-seven-hundred ppm is the required soluble boron for the fuel mishandling accident. One is not required to assume two unlikely, independent, concurrent events to ensure protection against a criticality accident. Thus, a final boron concentration of 970 ppm following a boron dilution accident would be acceptable. Conservatively, SCE has established a limit for final boron concentration following a boron dilution accident of 1,700 ppm. The difference between 970 ppm (required for $K_{eff} \leq 0.95$, non-accident conditions) and 1,700 ppm (assumed in the boron dilution analysis) is discretionary margin.

Previous decay heat and radiological analyses are not changed by the presence or absence of Boraflex in the spent fuel racks and taking credit for soluble boron.

Previous structural/seismic analyses are not changed by the presence or absence of Boraflex in the spent fuel racks, and stainless steel or aluminum guide tube inserts. The existing structural/seismic analyses performed for SONGS Units 2 and 3 spent fuel racks are conservative in the loadings of the storage cells and the results bound stainless steel or aluminum guide tube inserts (rodlets).

Two detailed reports are attached in Attachments J and K:

(Attachment J) Spent Fuel Pool Dilution Analysis, December 2001

(Attachment K) Spent Fuel Pool Criticality Analysis (With No Borafex And Credit For Soluble Boron), Revision 0, November 2001

The replacement of Figures 3.7.18-1 and 3.7.18-2 with Section 5.5.2.16 is an administrative change, not a technical change. This change maintains NRC control as Section 5.5.2.16, "Fuel Storage Program," is part of the Technical Specifications, and the Fuel Storage Program will be uniquely identified in Section 5.5.2.16 such that updates to the Fuel Storage Program will require NRC approval.

Without Section 5.5.2.16, Technical Specification 3.7.18, "Spent Fuel Assembly Storage," would need to change from its current 3 pages to approximately 50 pages. SCE believes that creating Section 5.5.2.16 is consistent with the technical specification improvement philosophy and is consistent with other Section 5 programs that are existing or are being considered by the NRC and the industry.

5.0 REGULATORY SAFETY ANALYSIS

5.1 <u>No Significant Hazards Consideration</u>

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   NO.

<u>Dropped Fuel Assembly</u>

There is no significant increase in the probability of a fuel assembly drop accident in the spent fuel pool when assuming a complete loss of the Boraflex panels in the spent fuel pool racks and considering the presence of soluble boron in the spent fuel pool water for criticality control.

The presence of soluble boron in the spent fuel pool water for criticality control does not increase the probability of a fuel assembly drop accident. The handling of the fuel assemblies in the spent fuel pool has always been performed in borated water, and the quantity of Boraflex remaining in the racks has no affect on the probability of such a drop accident.

Southern California Edison (SCE) has performed a criticality analysis which shows that the consequences of a fuel assembly drop accident in the spent fuel pool are not affected when considering a complete loss of the Boraflex in the spent fuel racks and the presence of soluble boron. The rack K_{eff} remains less than or equal to 0.95.

Fuel Misloading

There is no significant increase in the probability of the accidental misloading of spent fuel assemblies into the spent fuel racks when assuming a complete loss of the Boraflex panels and considering the presence of soluble boron in the pool water for criticality control. Fuel assembly placement will continue to be controlled pursuant to approved fuel handling procedures and will be in accordance with the Technical Specification Section 5.5.2.16, "Fuel Storage Program," which will specify spent fuel rack storage configuration limitations.

There is no increase in the consequences of the accidental misloading of a spent fuel assembly into the spent fuel racks. The criticality analysis, performed by SCE, demonstrates that the pool K_{eff} will be maintained less than or equal to 0.95 following an accidental misloading by the boron concentration of the pool. The proposed Technical Specification 3.7.17 will ensure that an adequate spent fuel pool boron concentration is maintained.

Significant Change in Spent Fuel Pool Temperature

There is no significant increase in the probability of either the loss of normal cooling to the spent fuel pool water or a decrease in pool water temperature from a large emergency makeup when assuming a complete loss of the Boraflex panels and considering the presence of soluble boron in the spent fuel pool water. A high concentration (> 2000 parts per million (ppm)) of soluble boron has always been maintained in the spent fuel pool water. The proposed minimum boron concentration of 2000 ppm in Technical Specification 3.7.17 will ensure that an adequate spent fuel pool concentration is maintained in the spent fuel pools.

A loss of normal cooling to the spent fuel pool water causes an increase in the temperature of the water passing through the stored fuel assemblies. This causes a decrease in water density, and when coupled with the assumption of a complete loss of Boraflex, may result in a positive reactivity addition. However, the additional negative reactivity provided by the boron concentration limit in the proposed Technical Specification 3.7.17 will compensate for the increased reactivity which could result from a loss of spent fuel pool cooling. Because adequate soluble boron will be maintained in the spent fuel pool water to maintain K_{eff} less than or equal to 0.95, the consequences of a loss of normal cooling to the spent fuel pool will not be increased.

A decrease in pool water temperature causes an increase in water density and may result in an increase in reactivity when the Boraflex panels are present in the racks. However, the additional negative reactivity provided by the boron concentration limit in the proposed Technical Specification 3.7.17, determined based on the conservative assumption of a complete loss of the Boraflex, will compensate for the increased reactivity which could result from a decrease in pool water temperature.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

   NO.

Criticality accidents in the spent fuel pool are not new or different. They have been analyzed in the Updated Final Safety Analysis Report (UFSAR) and in previous submittals to the Nuclear Regulatory Commission (NRC). Specific accidents considered and evaluated include fuel assembly drop, fuel assembly misloading in the racks, and spent fuel pool water temperature changes.

The possibility for creating a new or different kind of accident is not credible. Neither Boraflex or soluble boron are accident initiators. The proposed change takes credit for soluble boron in the spent fuel pool while maintaining the necessary margin of safety. Because soluble boron has always been present in the spent fuel pool, a dilution of the spent fuel pool soluble boron has always been a possibility. However this accident was not considered credible. For this proposed amendment, SCE performed a spent fuel pool dilution analysis, which demonstrated that a dilution of the boron concentration in the spent fuel pool water which could increase the rack K_{eff} to greater than 0.95 (constituting a reduction of the required margin to criticality) is not a credible event. The requirement to maintain boron concentration in the spent fuel pool water for reactivity control will have no effect on normal pool operations and maintenance. There are no changes in equipment design or in plant configuration. This new requirement will not result in the installation of any new equipment or modification of any existing equipment.

Therefore, the proposed change will not result in the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

   NO.

The Technical Specification changes proposed by this License Amendment request and the resulting spent fuel storage operation limits will provide adequate safety margin to ensure that the stored fuel assembly array will always remain subcritical. Those limits are based on a San Onofre Nuclear Generating Station (SONGS) Units 2 and 3 plant specific analysis performed in accordance with a methodology previously approved by the NRC.

The proposed change takes partial credit for soluble boron in the spent fuel pool. SCE's analyses show that spent fuel storage requirements meet the following NRC acceptance criteria for preventing criticality outside the reactor:

(1) The neutron multiplication factor, K_{eff} , including all uncertainties, shall be less than 1.0 when flooded with unborated water, and,

(2) The neutron multiplication factor, K_{eff}, including all uncertainties, shall be less than or equal to 0.95 when flooded with borated water.

The criticality analysis utilized credit for soluble boron to ensure K_{eff} will be less than or equal to 0.95 under normal circumstances, and storage configurations have been defined using a 95/95 K_{eff} calculation to ensure that the spent fuel rack will be less than 1.0 with no soluble boron. Soluble boron credit is used to provide safety margin by maintaining K_{eff} less than or equal to 0.95 including uncertainties, tolerances and accident conditions in the presence of spent fuel pool soluble boron. The loss of a substantial amount of soluble boron from the spent fuel pool water which could lead to K_{eff} exceeding 0.95 has been evaluated and shown to not be credible.

Also, the spent fuel rack K_{eff} will remain less than 1.0 with the spent fuel pool flooded with unborated water.

Decay heat, radiological effects, and seismic loads are unchanged by the absence of Boraflex.

Therefore, the proposed change does not involve a significant reduction in the plant's margin of safety.

5.2 Applicable Regulatory Requirements/Criteria

Code of Federal Regulations, 10 CFR 50, Appendix A

Criterion 61 -- Fuel storage and handling and radioactivity control. The fuel storage and handling, radioactive waste, and other systems which may contain radioactivity shall be designed to assure adequate safety under normal and postulated accident conditions. These systems shall be designed (1) with a capability to permit appropriate periodic inspection and testing of components important to safety, (2) with suitable shielding for radiation protection, (3) with appropriate containment, confinement, and filtering systems, (4) with a residual heat removal capability having reliability and testability that reflects the importance to safety of decay heat and other residual heat removal, and (5) to prevent significant reduction in fuel storage coolant inventory under accident conditions.

Criterion 62 -- Prevention of criticality in fuel storage and handling. Criticality in the fuel storage and handling system shall be prevented by physical systems or processes, preferably by use of geometrically safe configurations.

Criterion 63 -- Monitoring fuel and waste storage. Appropriate systems shall be provided in fuel storage and radioactive waste systems and associated handling areas (1) to detect conditions that may result in loss of residual heat removal capability and excessive radiation levels and (2) to initiate appropriate safety actions.

The NRC initially reviewed the fuel handling and storage at San Onofre Units 2 and 3 and found it acceptable, as documented in NUREG 0712, Reference 1. On May 1, 1990, the NRC staff issued the safety evaluation report, Reference 2, prior to spent fuel pool rack replacement. As documented in Reference 2, the staff found that SCE met the requirements of 10 CFR 50, Appendix A, General Design Criterion 61, regarding the capability to permit appropriate periodic inspection and testing of fuel storage components, and General Design Criterion 62, regarding prevention of criticality by the structural integrity of components and of the boron absorber. On September 19, 1996, a letter to SCE from the NRC, Reference 3, documented the completion of a detailed review of spent fuel storage pool safety issues. The results of the staff's review are documented in a report to the Commission. In the report, the staff concluded that existing structures, systems, and components related to the storage of irradiated fuel provide adequate protection of public health and safety. This report addressed adherence to General Design Criteria 61, 62, and 63. By letter dated October 3, 1996, Reference 4, the NRC issued amendments which revised Technical Specification Section 4.3, "Fuel Storage," to allow fuel assemblies having a maximum U-235 enrichment of 4.8 weight percent (w/o) to be stored in the spent fuel racks. The safety evaluation report enclosed with the October 3, 1996, letter stated that General Design Criterion 62 continued to be satisfied.

SCE is anticipating that in the future, the Boraflex panels that line the fuel storage cells will cease to effectively absorb neutrons, and therefore, SCE will not be able to credit Boraflex in maintaining K_{eff} to less than 0.95. The purpose of the proposed technical specifications is to provide fuel storage design (without Boraflex), and fuel storage configuration requirements (based on initial enrichment, burnup, and cooling time), to maintain K_{eff} less than 1, and to maintain K_{eff} less than or equal to 0.95 with soluble boron. The anticipated loss of Boraflex and the crediting of soluble boron, already present in the spent fuel pool, does not affect the ability of the fuel storage and handling system to meet Criterion 61 and Criterion 63. Therefore, the previously reviewed findings that General Design Criterion 61 and 63 are met at San Onofre Units 2 and 3 are not affected by this proposed change.

The proposed Fuel Storage Program, Attachment I, meets General Design Criterion 62 by establishing allowable storage configurations that will maintain K_{eff} to less than 1.0. Soluble boron is credited to maintain K_{eff} to less than or equal to 0.95. The proposed Fuel Storage Program is being submitted to the NRC for review and approval. Technical Specification 5.5.2.16, "Fuel Storage Program," will be implemented by station procedures which provide a process to maintain the fuel storage in safe configurations.

Regulatory Guide

Regulatory Guide 1.13 "Spent Fuel Storage Facility Design Basis" describes a method acceptable to the NRC staff for implementing Criterion 61. As stated above, the ability of the fuel storage and handling system to meet Criterion 61 is not affected by this proposed change.

Regulatory Correspondence

Nuclear Regulatory Commission, Letter to All Power Reactor Licensees, B. K. Grimes, April 14, 1978, "OT Position for Review and Acceptance of Spent Fuel Storage and Handling Applications," as amended by the NRC letter dated January 18, 1979

USNRC, Office Of Nuclear Reactor Regulation, Reactor Systems Branch, 1998, "Guidance On The Regulatory Requirements For Criticality Analysis Of Fuel Storage At Light-Water Reactor Power Plants"

NRC Regulatory Issue Summary 2001-12, May 18, 2001, "Nonconservatism in Pressurized Water Reactor Spent Fuel Storage Pool Reactivity Equivalencing Calculations"

The criticality analysis, Attachment K, which supports the proposed Fuel Storage Program, Attachment I, addressed the guidance provided in the above correspondence.

5.3 Administrative Controls

Storage of fuel assemblies in the SONGS Units 2 and 3 spent fuel storage racks will be in accordance with the administrative controls described in Technical Specification Section 5.5.2.16, "Fuel Storage Program."

The "Fuel Storage Program (Assuming No Boraflex), San Onofre Nuclear Generating Station, Units 2 and 3," is being submitted as part of this Amendment Application for NRC review and approval. Section 5.5.2.16 will contain the approval date and NRC transmittal letter information. Changes to the Fuel Storage Program will require prior NRC approval.

5.4 Conclusion

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

6.0 ENVIRONMENTAL CONSIDERATION

The proposed Technical Specification amendment has been reviewed against the criteria of 10 CFR 51.22 for environmental considerations. SCE has determined that the proposed amendment does not involve a significant hazards consideration, nor increase the types and amounts of effluents that may be released offsite, nor increase individual or cumulative occupational radiation exposures. Therefore, the proposed amendment meets the criteria given in 10 CFR 51.22(c)(9) for a categorical exclusion from the requirement for an Environmental Impact Assessment.

7.0 REFERENCES

(1) NUREG-0712 Safety Evaluation Report Related to the Operation of San Onofre Nuclear Generating Station, Units 2 and 3, dated February 1981

(2) Letter from L. E. Kokajko (NRC) to H. B. Ray (SCE) dated May 1, 1990; Subject: Issuance of Amendment No.87 to Faciltiy Operating License No. NPF-10 and Amendment No.77 to Faciltiy Operating License No. NPF-15, San Onofre Nuclear Generating Station, Unit Nos. 2 and 3, (TAC Nos. 68308 and 68309)

(3) Letter from M. B. Fields (NRC) to H. B. Ray (SCE) dated September 19, 1996; Subject: Resolution of Spent Fuel Storage Pool Safety Issues: Issuance of Final Report, San Onofre Nuclear Generating Station, Units. 2 and 3, (TAC No. M88094)

(4) Letter from M. B. Fields (NRC) to H. B. Ray (SCE) dated October 3, 1996, Issuance of Amendment for San Onofre Nuclear Generating Station Unit No. 2 (TAC N0. M94624) and UNIT No. 3 (TAC NO. M94625)

Attachment A

(Existing Technical Specification Pages, Unit 2)

3.7 PLANT SYSTEMS

3.7.17 Fuel Storage Pool Boron Concentration

LCO 3.7.17 The fuel storage pool boron concentration shall be ≥ 1850 ppm.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Fuel storage pool boron concentration not within limit.	------------NOTE------------- LCO 3.0.3 is not applicable. ----------------------------	
	A.1 Suspend movement of fuel assemblies in the fuel storage pool.	Immediately
	AND	
	A.2.1 Initiate action to restore fuel storage pool boron concentration to within limit.	Immediately
	OR	
	A.2.2 Verify by administrative means Region II fuel storage pool verification has been performed since the last movement of fuel assemblies in the fuel storage pool.	Immediately

3.7 PLANT SYSTEMS

3.7.18 Spent Fuel Assembly Storage

LCO 3.7.18 The combination of initial enrichment and burnup of each SONGS 2 and 3 spent fuel assembly stored in Region II shall be within the acceptable burnup domain of Figure 3.7.18-1 or Figure 3.7.18-2, or the fuel assembly shall be stored in accordance with Licensee Controlled Specification 4.0.100.

The burnup of each SONGS 1 uranium dioxide spent fuel assembly stored in Region II shall be greater than or equal to 18.0 GWD/T for interior locations of 5.5 GWD/T for peripheral locations, or the fuel assembly shall be stored in accordance with Licensee Controlled Specification 4.0.100.

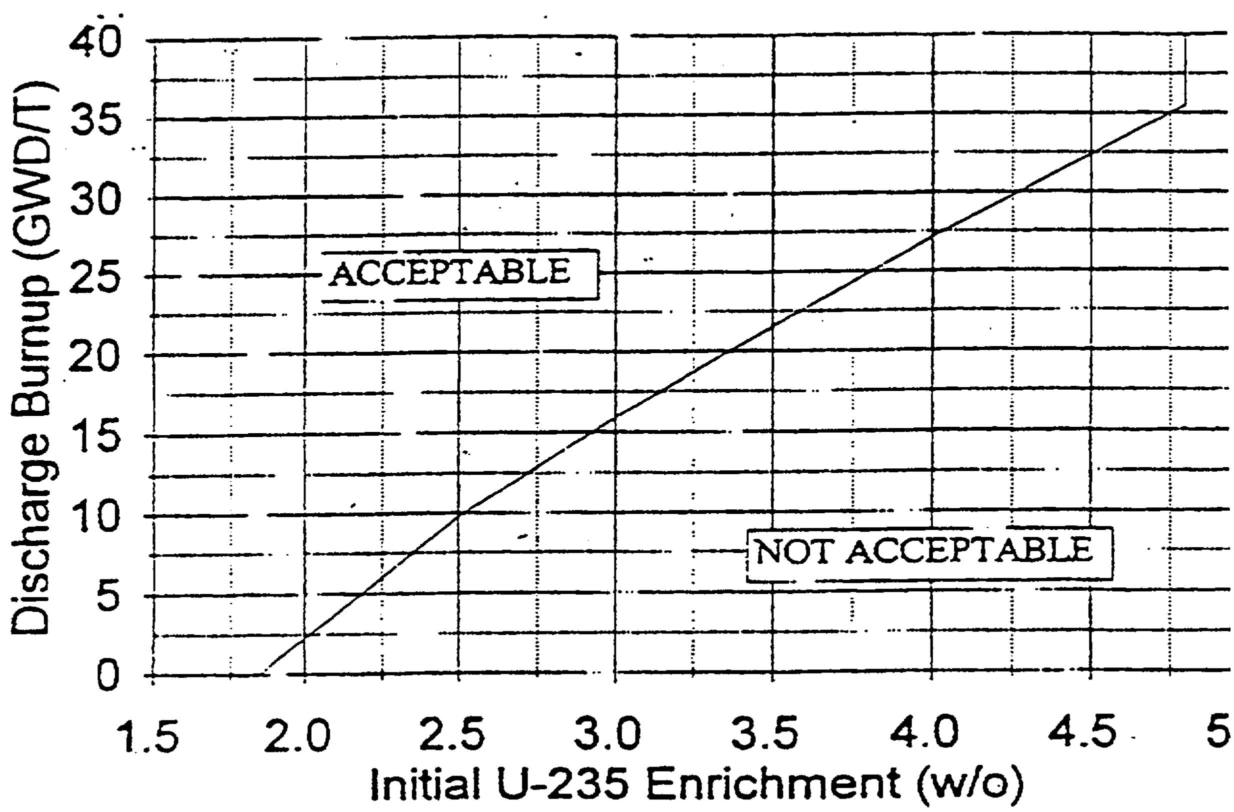
APPLICABILITY: Whenever any fuel assembly is stored in Region II of the fuel storage pool.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of the LCO not met.	A.1 --------NOTE--------- LCO 3.0.3 is not applicable. --------------------- Initiate action to move the noncomplying fuel assembly from Region II.	Immediately

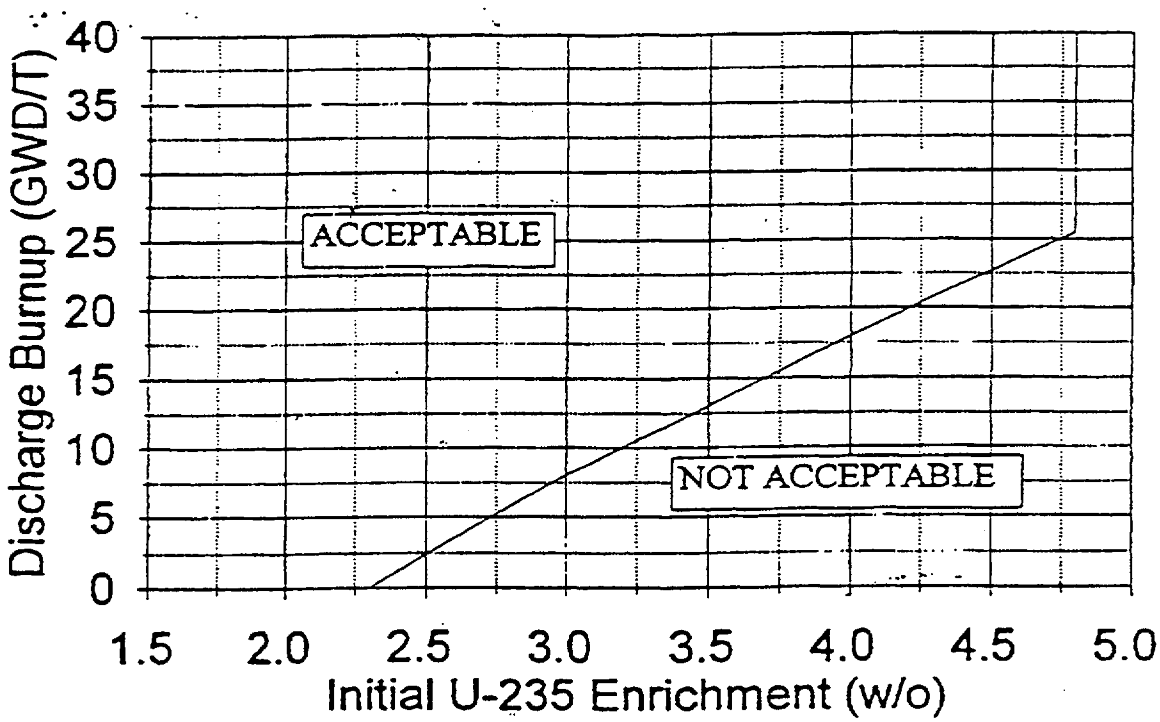
SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.18.1	Verify by administrative means the initial enrichment and burnup of the fuel assembly is in accordance with LCO 3.7.18.	Prior to storing the fuel assembly in Region II



MINIMUM BURNUP VS. INITIAL ENRICHMENT FOR UNRESTRICTED PLACEMENT OF SONGS 2 AND 3 FUEL IN REGION II RACKS

FIGURE 3.7.18-1



MINIMUM BURNUP VS. INITIAL ENRICHMENT FOR PLACEMENT
OF SONGS 2 AND 3 FUEL IN REGION II PERIPHERAL POOL LOCATIONS

FIGURE 3.7.18-2

4.0 DESIGN FEATURES (continued)

4.3 Fuel Storage

4.3.1 Criticality

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

a. Fuel assemblies having a maximum U-235 enrichment of 4.8 weight percent;

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

c. A nominal 8.85 inch center to center distance between fuel assemblies placed in Region II;

d. A nominal 10.40 inch center to center distance between fuel assemblies placed in Region I;

e. Units 1, 2, and 3 fuel assemblies may be stored in Region I with no restrictions;

f. Units 2 and 3 fuel assemblies with a burnup in the "acceptable range" of Figure 3.7.18-1 are allowed unrestricted storage in Region II;

g. Units 2 and 3 fuel assemblies with a burnup in the "acceptable range" of Figure 3.7.18-2 are allowed unrestricted storage in the peripheral pool locations with 1 or 2 faces toward the spent fuel pool walls of Region II;

h. Fuel assemblies with a burnup in the "unacceptable range" of Figure 3.7.18-1 and Figure 3.7.18-2 will be stored in compliance with the Licensee Controlled Specification 4.0.100; and

i. The burnup of each SONGS 1 uranium dioxide spent fuel assembly stored in Region II shall be greater than or equal to 18.0 GWD/T for interior locations or 5.5 GWD/T for peripheral locations, or the fuel assembly shall be stored in accordance with Licensee Controlled Specification 4.0.100.

(continued)

5.5 Procedures, Programs, and Manuals (continued)

5.5.2.15 Containment Leakage Rate Testing Program (Continued)

The provisions of Surveillance Requirement 3.0.2 do not apply to the test frequencies specified in the Containment Leakage Rate Testing Program. However, test frequencies specified in this Program may be extended consistent with the guidance provided in NEI 94-01, "Industry Guideline For Implementing Performance-Based Option Of 10CFR 50, Appendix J," as endorsed by Regulatory Guide 1.163. Specifically, NEI 94-01 has these provisions for test frequencies extension:

1. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for recommended Type A testing may be extended by up to 15 months. This option should be used only in cases where refueling schedules have been changed to accommodate other factors.

2. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for the recommended surveillance frequency for Type B and Type C testing may be extended by up to 25 percent of the test interval, not to exceed 15 months.

The provisions of Surveillance Requirement 3.0.3 are applicable to the Containment Leakage Rate Testing Program.

Attachment B

(Existing Technical Specification Pages, Unit 3)

3.7 PLANT SYSTEMS

3.7.17 Fuel Storage Pool Boron Concentration

LCO 3.7.17 The fuel storage pool boron concentration shall be ≥ 1850 ppm.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Fuel storage pool boron concentration not within limit.	------------NOTE------------ LCO 3.0.3 is not applicable. ----------------------------	
	A.1 Suspend movement of fuel assemblies in the fuel storage pool.	Immediately
	AND	
	A.2.1 Initiate action to restore fuel storage pool boron concentration to within limit.	Immediately
	OR	
	A.2.2 Verify by administrative means Region II fuel storage pool verification has been performed since the last movement of fuel assemblies in the fuel storage pool.	Immediately

3.7 PLANT SYSTEMS

3.7.18 Spent Fuel Assembly Storage

LCO 3.7.18 The combination of initial enrichment and burnup of each SONGS 2 and 3 spent fuel assembly stored in Region II shall be within the acceptable burnup domain of Figure 3.7.18-1 or Figure 3.7.18-2, or the fuel assembly shall be stored in accordance with Licensee Controlled Specification 4.0.100.

The burnup of each SONGS 1 uranium dioxide spent fuel assembly stored in Region II shall be greater than or equal to 18.0 GWD/T for interior locations of 5.5 GWD/T for peripheral locations, or the fuel assembly shall be stored in accordance with Licensee Controlled Specification 4.0.100.

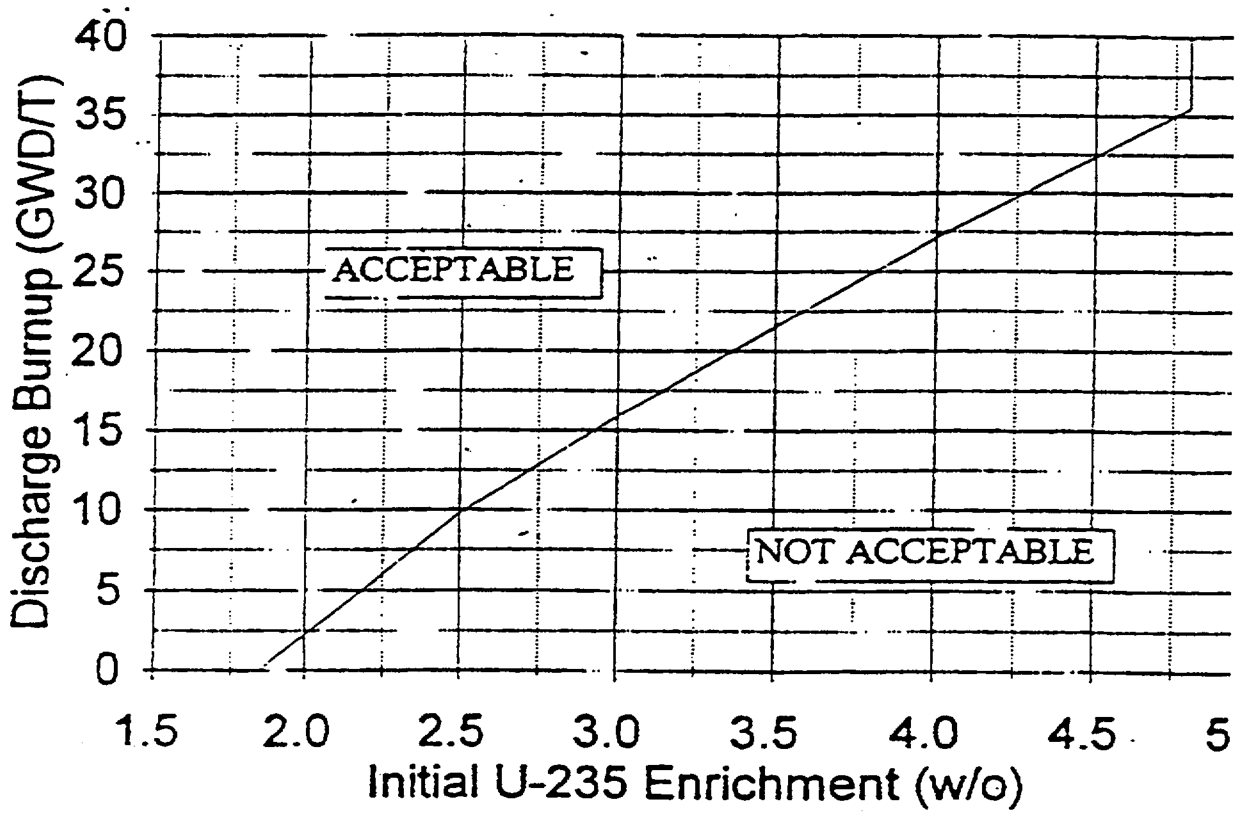
APPLICABILITY: Whenever any fuel assembly is stored in Region II of the fuel storage pool.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of the LCO not met.	A.1 --------NOTE--------- LCO 3.0.3 is not applicable. --------------------- Initiate action to move the noncomplying fuel assembly from Region II.	 Immediately

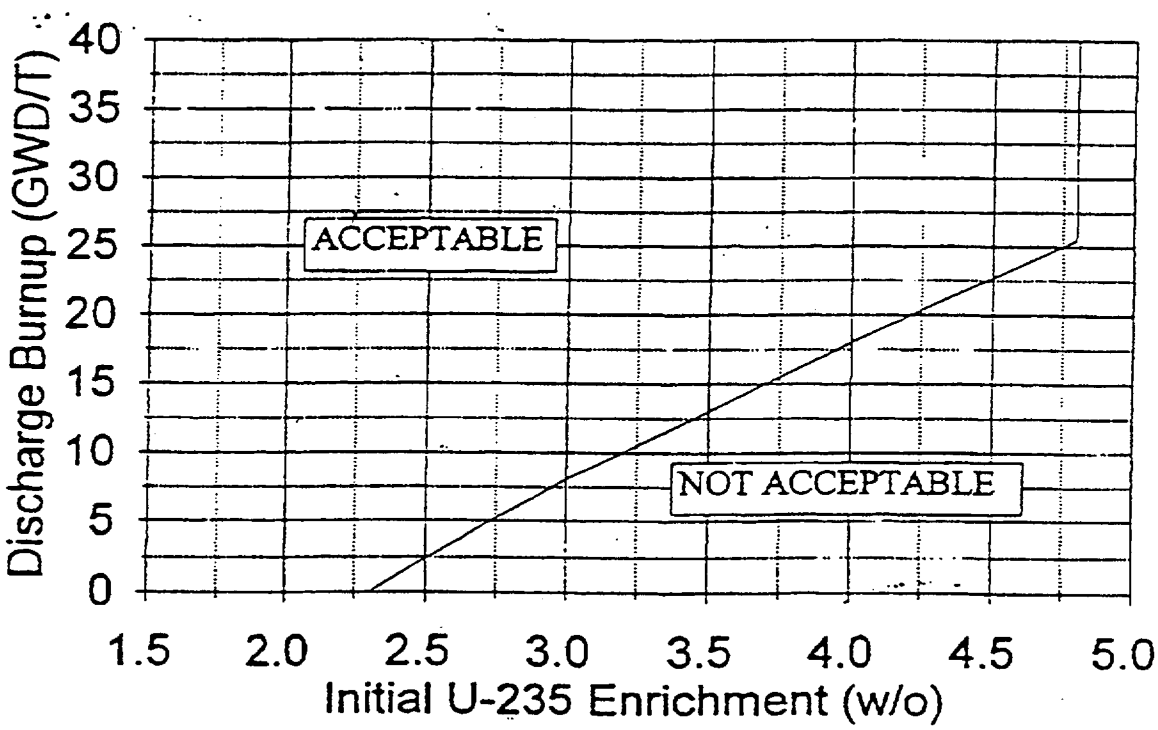
SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.18.1	Verify by administrative means the initial enrichment and burnup of the fuel assembly is in accordance with LCO 3.7.18.	Prior to storing the fuel assembly in Region II



MINIMUM BURNUP VS. INITIAL ENRICHMENT FOR UNRESTRICTED
PLACEMENT OF SONGS 2 AND 3 FUEL IN REGION II RACKS

FIGURE 3.7.18-1



MINIMUM BURNUP VS. INITIAL ENRICHMENT FOR PLACEMENT
OF SONGS 2 AND 3 FUEL IN REGION II PERIPHERAL POOL LOCATIONS

FIGURE 3.7.18-2

4.0 DESIGN FEATURES (continued)

4.3 Fuel Storage

4.3.1 Criticality

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

a. Fuel assemblies having a maximum U-235 enrichment of 4.8 weight percent;

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

c. A nominal 8.85 inch center to center distance between fuel assemblies placed in Region II;

d. A nominal 10.40 inch center to center distance between fuel assemblies placed in Region I;

e. Units 1, 2, and 3 fuel assemblies may be stored in Region I with no restrictions;

f. Units 2 and 3 fuel assemblies with a burnup in the "acceptable range" of Figure 3.7.18-1 are allowed unrestricted storage in Region II;

g. Units 2 and 3 fuel assemblies with a burnup in the "acceptable range" of Figure 3.7.18-2 are allowed unrestricted storage in the peripheral pool locations with 1 or 2 faces toward the spent fuel pool walls of Region II;

h. Fuel assemblies with a burnup in the "unacceptable range" of Figure 3.7.18-1 and Figure 3.7.18-2 will be stored in compliance with the Licensee Controlled Specification 4.0.100; and

i. The burnup of each SONGS 1 uranium dioxide spent fuel assembly stored in Region II shall be greater than or equal to 18.0 GWD/T for interior locations or 5.5 GWD/T for peripheral locations, or the fuel assembly shall be stored in accordance with Licensee Controlled Specification 4.0.100.

(continued)

5.5 Procedures, Programs, and Manuals (continued)

5.5.2.15 Containment Leakage Rate Testing Program (Continued)

The provisions of Surveillance Requirement 3.0.2 do not apply to the test frequencies specified in the Containment Leakage Rate Testing Program. However, test frequencies specified in this Program may be extended consistent with the guidance provided in NEI 94-01, "Industry Guideline For Implementing Performance-Based Option Of 10CFR 50, Appendix J," as endorsed by Regulatory Guide 1.163. Specifically, NEI 94-01 has these provisions for test frequencies extension:

1. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for recommended Type A testing may be extended by up to 15 months. This option should be used only in cases where refueling schedules have been changed to accommodate other factors.

2. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for the recommended surveillance frequency for Type B and Type C testing may be extended by up to 25 percent of the test interval, not to exceed 15 months.

The provisions of Surveillance Requirement 3.0.3 are applicable to the Containment Leakage Rate Testing Program.

Attachment C

(Proposed Technical Specification Pages)

(Redline and Strikeout, Unit 2)

3.7 PLANT SYSTEMS

3.7.17 Fuel Storage Pool Boron Concentration

LCO 3.7.17 The fuel storage pool boron concentration shall be ≥ ~~1850~~2000 ppm.

APPLICABILITY: Whenever any fuel assembly~~ies~~ ~~are~~is stored in the fuel storage pool.~~ and a fuel storage pool verification has not been performed since the last movement of fuel assemblies in the fuel storage pool.~~

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Fuel storage pool boron concentration not within limit.	------------NOTE------------ LCO 3.0.3 is not applicable. ----------------------------	
	A.1 Suspend movement of fuel assemblies in the fuel storage pool.	Immediately
	AND	
	A.2~~.1~~ Initiate action to restore fuel storage pool boron concentration to within limit.	Immediately
	~~OR~~	
	~~A.2.2 Verify by administrative means Region II fuel storage pool verification has been performed since the last movement of fuel assemblies in the fuel storage pool.~~	~~Immediately~~

3.7 PLANT SYSTEMS

3.7.18 Spent Fuel Assembly Storage

LCO 3.7.18 ~~The combination of initial enrichment and burnup of each SONGS 2 and 3 spent fuel assembly stored in Region II shall be within the acceptable burnup domain of Figure 3.7.18-1 or Figure 3.7.18-2, or the fuel assembly shall be stored in accordance with Licensee Controlled Specification 4.0.100. The burnup of each SONGS 1 uranium dioxide spent fuel assembly stored in Region II shall be greater than or equal to 18.0 GWD/T for interior locations of 5.5 GWD/T for peripheral locations, or the fuel assembly shall be stored in accordance with Licensee Controlled Specification 4.0.100.~~
The storage of SONGS Units 1, 2, and 3 fuel assemblies in the spent fuel storage racks shall be in accordance with Technical Specification 5.5.2.16, "Fuel Storage Program."

APPLICABILITY: Whenever any fuel assembly is stored in ~~Region II of~~ the fuel storage pool.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Requirements of the LCO not met.	A.1	--------NOTE--------- LCO 3.0.3 is not applicable. --------------------- Initiate action to ~~move~~ bring the noncomplying fuel assembly ~~from Region I~~ into compliance.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.18.1	Verify by administrative means the initial enrichment, ~~and~~ burnup, and cooling time of the fuel assembly ~~is~~ are in accordance with LCO 3.7.18.	Prior to storing the fuel assembly in Region I or II

FIGURE DELETED

MINIMUM BURNUP VS. INITIAL ENRICHMENT FOR UNRESTRICTED PLACEMENT OF SONGS 2 AND 3 FUEL IN REGION II RACKS

FIGURE 3.7.18-1

FIGURE DELETED

~~MINIMUM BURNUP VS. INITIAL ENRICHMENT FOR PLACEMENT OF SONGS 2 AND 3 FUEL IN REGION II PERIPHERAL POOL LOCATIONS~~

~~FIGURE 3.7.18-2~~

4.0 DESIGN FEATURES (continued)

4.3 Fuel Storage

4.3.1 <u>Criticality</u>

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

a. Fuel assemblies having a maximum nominal U-235 enrichment of 4.8 weight percent;

b. K_{eff} ~~≤~~< ~~0.95~~1.0 if fully flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.1 of the UFSAR;

c. $K_{eff} \leq 0.95$ if fully flooded with water borated to 1700 ppm, which includes an allowance for uncertainties as described in Section 9.1 of the UFSAR;

~~c.~~d. A nominal 8.85 inch center to center distance between fuel assemblies placed in Region II;

~~d.~~e. A nominal 10.40 inch center to center distance between fuel assemblies placed in Region I; and

~~e.~~f. Units 1, 2, and 3 fuel assemblies ~~may be stored in Region I with no restrictions;~~shall be stored in accordance with Technical Specification 5.5.2.16, "Fuel Storage Program."

~~f. Units 2 and 3 fuel assemblies with a burnup in the "acceptable range" of Figure 3.7.18-1 are allowed unrestricted storage in Region II;~~

~~g. Units 2 and 3 fuel assemblies with a burnup in the "acceptable range" of Figure 3.7.18-2 are allowed unrestricted storage in the peripheral pool locations with 1 or 2 faces toward the spent fuel pool walls of Region II;~~

~~h. Fuel assemblies with a burnup in the "unacceptable range" of Figure 3.7.18-1 and Figure 3.7.18-2 will be stored in compliance with the Licensee Controlled Specification 4.0.100; and~~

~~i. The burnup of each SONGS 1 uranium dioxide spent fuel assembly stored in Region II shall be greater than or equal to 18.0 GWD/T for interior locations or 5.5 GWD/T for peripheral locations, or the fuel assembly shall be stored in accordance with Licensee Controlled Specification 4.0.100.~~

(continued)

5.5 Procedures, Programs, and Manuals (continued)

5.5.2.15 Containment Leakage Rate Testing Program (Continued)

The provisions of Surveillance Requirement 3.0.2 do not apply to the test frequencies specified in the Containment Leakage Rate Testing Program. However, test frequencies specified in this Program may be extended consistent with the guidance provided in NEI 94-01, "Industry Guideline For Implementing Performance-Based Option Of 10CFR 50, Appendix J," as endorsed by Regulatory Guide 1.163. Specifically, NEI 94-01 has these provisions for test frequencies extension:

1. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for recommended Type A testing may be extended by up to 15 months. This option should be used only in cases where refueling schedules have been changed to accommodate other factors.

2. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for the recommended surveillance frequency for Type B and Type C testing may be extended by up to 25 percent of the test interval, not to exceed 15 months.

The provisions of Surveillance Requirement 3.0.3 are applicable to the Containment Leakage Rate Testing Program.

5.5.2.16 Fuel Storage Program

a. A program shall be established to provide safe storage of fuel assemblies in the SONGS Units 2 and 3 spent fuel storage racks assuming no Boraflex, and taking credit for soluble boron in the spent fuel pool water.

The program, in conjunction with Technical Specifications 3.7.17, "Fuel Storage Boron Concentration," 3.7.18, "Spent Fuel Assembly Storage," and 4.3, "Fuel Storage," shall assure that:

(1) Under normal conditions, the 95/95 neutron multiplication factor (K_{eff}), including all uncertainties, shall be less than 1.0 when flooded with unborated water.

(2) Under normal and accident conditions, the 95/95 neutron multiplication factor (K_{eff}), including all uncertainties, shall be less than or equal to 0.95 when flooded with borated water.

(continued)

5.5 Procedures, Programs, and Manuals (continued)

5.5.2.16 Fuel Storage Program (continued)

b. The storage requirements, based on initial enrichment, burnup data, and cooling time (which determines plutonium decay) shall be contained in a program document previously approved by the NRC. SONGS Units 2 and 3 fuel storage pool shall be maintained in accordance with: "Fuel Storage Program (Assuming No Boraflex) San Onofre Nuclear Generating Station Units 2 and 3, February 2002" approved by the NRC Safety Evaluation Report transmitted in a letter from _____ (NRC) to _______ (SCE), dated _________; Subject: __________

Attachment D

(Proposed Technical Specification Pages)

(Redline and Strikeout, Unit 3)

3.7 PLANT SYSTEMS

3.7.17 Fuel Storage Pool Boron Concentration

LCO 3.7.17 The fuel storage pool boron concentration shall be ≥ ~~1850~~2000 ppm.

APPLICABILITY: Whenever any fuel assembly~~ies~~ ~~are~~is stored in the fuel storage pool.~~ and a fuel storage pool verification has not been performed since the last movement of fuel assemblies in the fuel storage pool.~~

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Fuel storage pool boron concentration not within limit.	------------NOTE------------ LCO 3.0.3 is not applicable. ----------------------------	
	A.1 Suspend movement of fuel assemblies in the fuel storage pool.	Immediately
	AND	
	A.2~~.1~~ Initiate action to restore fuel storage pool boron concentration to within limit.	Immediately
	~~OR~~	
	~~A.2.2 Verify by administrative means Region II fuel storage pool verification has been performed since the last movement of fuel assemblies in the fuel storage pool.~~	~~Immediately~~

3.7 PLANT SYSTEMS

3.7.18 Spent Fuel Assembly Storage

LCO 3.7.18

~~The combination of initial enrichment and burnup of each SONGS 2 and 3 spent fuel assembly stored in Region II shall be within the acceptable burnup domain of Figure 3.7.18-1 or Figure 3.7.18-2, or the fuel assembly shall be stored in accordance with Licensee Controlled Specification 4.0.100. The burnup of each SONGS 1 uranium dioxide spent fuel assembly stored in Region II shall be greater than or equal to 18.0 GWD/T for interior locations of 5.5 GWD/T for peripheral locations, or the fuel assembly shall be stored in accordance with Licensee Controlled Specification 4.0.100.~~

The storage of SONGS Units 1, 2, and 3 fuel assemblies in the spent fuel storage racks shall be in accordance with Technical Specification 5.5.2.16, "Fuel Storage Program."

APPLICABILITY: Whenever any fuel assembly is stored in ~~Region II of~~ the fuel storage pool.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of the LCO not met.	A.1 --------NOTE--------- LCO 3.0.3 is not applicable. --------------------- Initiate action to ~~move~~bring the noncomplying fuel assembly ~~from Region I~~into compliance.	 Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.7.18.1 Verify by administrative means the initial enrichment, ~~and~~ burnup, and cooling time of the fuel assembly ~~is~~are in accordance with LCO 3.7.18.	Prior to storing the fuel assembly in Region I or II

FIGURE DELETED

~~MINIMUM BURNUP VS. INITIAL ENRICHMENT FOR UNRESTRICTED PLACEMENT OF SONGS 2 AND 3 FUEL IN REGION II RACKS~~

~~FIGURE 3.7.18-1~~

FIGURE DELETED

~~MINIMUM BURNUP VS. INITIAL ENRICHMENT FOR PLACEMENT OF SONGS 2 AND 3 FUEL IN REGION II PERIPHERAL POOL LOCATIONS~~

~~FIGURE 3.7.18-2~~

4.0 DESIGN FEATURES (continued)

4.3 Fuel Storage

4.3.1 Criticality

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

a. Fuel assemblies having a maximum nominal U-235 enrichment of 4.8 weight percent;

b. K_{eff} ~~≤~~< ~~0.95~~1.0 if fully flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.1 of the UFSAR;

c. $K_{eff} \leq 0.95$ if fully flooded with water borated to 1700 ppm, which includes an allowance for uncertainties as described in Section 9.1 of the UFSAR;

~~c.~~d. A nominal 8.85 inch center to center distance between fuel assemblies placed in Region II;

~~d.~~e. A nominal 10.40 inch center to center distance between fuel assemblies placed in Region I; and

~~e.~~f. Units 1, 2, and 3 fuel assemblies ~~may be stored in Region I with no restrictions;~~shall be stored in accordance with Technical Specification 5.5.2.16, "Fuel Storage Program."

~~f. Units 2 and 3 fuel assemblies with a burnup in the "acceptable range" of Figure 3.7.18-1 are allowed unrestricted storage in Region II;~~

~~g. Units 2 and 3 fuel assemblies with a burnup in the "acceptable range" of Figure 3.7.18-2 are allowed unrestricted storage in the peripheral pool locations with 1 or 2 faces toward the spent fuel pool walls of Region II;~~

~~h. Fuel assemblies with a burnup in the "unacceptable range" of Figure 3.7.18-1 and Figure 3.7.18-2 will be stored in compliance with the Licensee Controlled Specification 4.0.100; and~~

~~i. The burnup of each SONGS 1 uranium dioxide spent fuel assembly stored in Region II shall be greater than or equal to 18.0 GWD/T for interior locations or 5.5 GWD/T for peripheral locations, or the fuel assembly shall be stored in accordance with Licensee Controlled Specification 4.0.100.~~

(continued)

5.5 Procedures, Programs, and Manuals (continued)

5.5.2.15 Containment Leakage Rate Testing Program (Continued)

The provisions of Surveillance Requirement 3.0.2 do not apply to the test frequencies specified in the Containment Leakage Rate Testing Program. However, test frequencies specified in this Program may be extended consistent with the guidance provided in NEI 94-01, "Industry Guideline For Implementing Performance-Based Option Of 10CFR 50, Appendix J," as endorsed by Regulatory Guide 1.163. Specifically, NEI 94-01 has these provisions for test frequencies extension:

1. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for recommended Type A testing may be extended by up to 15 months. This option should be used only in cases where refueling schedules have been changed to accommodate other factors.

2. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for the recommended surveillance frequency for Type B and Type C testing may be extended by up to 25 percent of the test interval, not to exceed 15 months.

The provisions of Surveillance Requirement 3.0.3 are applicable to the Containment Leakage Rate Testing Program.

5.5.2.16 Fuel Storage Program

a. A program shall be established to provide safe storage of fuel assemblies in the SONGS Units 2 and 3 spent fuel storage racks assuming no Boraflex, and taking credit for soluble boron in the spent fuel pool water.

The program, in conjunction with Technical Specifications 3.7.17, "Fuel Storage Boron Concentration," 3.7.18, "Spent Fuel Assembly Storage," and 4.3, "Fuel Storage," shall assure that:

(1) Under normal conditions, the 95/95 neutron multiplication factor (K_{eff}), including all uncertainties, shall be less than 1.0 when flooded with unborated water.

(2) Under normal and accident conditions, the 95/95 neutron multiplication factor (K_{eff}), including all uncertainties, shall be less than or equal to 0.95 when flooded with borated water.

~~(continued)~~

5.5 Procedures, Programs, and Manuals (continued)

5.5.2.16 Fuel Storage Program (continued)

b. The storage requirements, based on initial enrichment, burnup data, and cooling time (which determines plutonium decay) shall be contained in a program document previously approved by the NRC. SONGS Units 2 and 3 fuel storage pool shall be maintained in accordance with: "Fuel Storage Program (Assuming No Boraflex) San Onofre Nuclear Generating Station Units 2 and 3, February 2002" approved by the NRC Safety Evaluation Report transmitted in a letter from _____ (NRC) to ______ (SCE), dated ________; Subject: _________

Attachment E

(Proposed Technical Specification Pages, Unit 2)

3.7 PLANT SYSTEMS

3.7.17 Fuel Storage Pool Boron Concentration

LCO 3.7.17 The fuel storage pool boron concentration shall be ≥ 2000 ppm.

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

ACTIONS

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

3.7 PLANT SYSTEMS

3.7.18 Spent Fuel Assembly Storage

LCO 3.7.18 The storage of SONGS Units 1, 2, and 3 fuel assemblies in the spent fuel storage racks shall be in accordance with Technical Specification 5.5.2.16, "Fuel Storage Program."

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

ACTIONS

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

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.18.1	Verify by administrative means the initial enrichment, burnup, and cooling time of the fuel assembly are in accordance with LCO 3.7.18.	Prior to storing the fuel assembly in Region I or II

FIGURE DELETED

FIGURE DELETED

4.0 DESIGN FEATURES (continued)

4.3 Fuel Storage

4.3.1 Criticality

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

a. Fuel assemblies having a maximum nominal U-235 enrichment of 4.8 weight percent;

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

c. $K_{eff} \leq 0.95$ if fully flooded with water borated to 1700 ppm, which includes an allowance for uncertainties as described in Section 9.1 of the UFSAR;

d. A nominal 8.85 inch center to center distance between fuel assemblies placed in Region II;

e. A nominal 10.40 inch center to center distance between fuel assemblies placed in Region I; and

f. Units 1, 2, and 3 fuel assemblies shall be stored in accordance with Technical Specification 5.5.2.16, "Fuel Storage Program."

(continued)

5.5 Procedures, Programs, and Manuals (continued)

5.5.2.15 Containment Leakage Rate Testing Program (Continued)

The provisions of Surveillance Requirement 3.0.2 do not apply to the test frequencies specified in the Containment Leakage Rate Testing Program. However, test frequencies specified in this Program may be extended consistent with the guidance provided in NEI 94-01, "Industry Guideline For Implementing Performance-Based Option Of 10CFR 50, Appendix J," as endorsed by Regulatory Guide 1.163. Specifically, NEI 94-01 has these provisions for test frequencies extension:

1. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for recommended Type A testing may be extended by up to 15 months. This option should be used only in cases where refueling schedules have been changed to accommodate other factors.

2. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for the recommended surveillance frequency for Type B and Type C testing may be extended by up to 25 percent of the test interval, not to exceed 15 months.

The provisions of Surveillance Requirement 3.0.3 are applicable to the Containment Leakage Rate Testing Program.

5.5.2.16 Fuel Storage Program

a. A program shall be established to provide safe storage of fuel assemblies in the SONGS Units 2 and 3 spent fuel storage racks assuming no Boraflex, and taking credit for soluble boron in the spent fuel pool water.

The program, in conjunction with Technical Specifications 3.7.17, "Fuel Storage Boron Concentration," 3.7.18, "Spent Fuel Assembly Storage," and 4.3, "Fuel Storage," shall assure that:

(1) Under normal conditions, the 95/95 neutron multiplication factor (K_{eff}), including all uncertainties, shall be less than 1.0 when flooded with unborated water.

(2) Under normal and accident conditions, the 95/95 neutron multiplication factor (K_{eff}), including all uncertainties, shall be less than or equal to 0.95 when flooded with borated water.

(continued)

5.5 Procedures, Programs, and Manuals (continued)

5.5.2.16 Fuel Storage Program (continued)

b. The storage requirements, based on initial enrichment, burnup data, and cooling time (which determines plutonium decay) shall be contained in a program document previously approved by the NRC. SONGS Units 2 and 3 fuel storage pool shall be maintained in accordance with: "Fuel Storage Program (Assuming No Boraflex) San Onofre Nuclear Generating Station Units 2 and 3, February 2002" approved by the NRC Safety Evaluation Report transmitted in a letter from ______ (NRC) to _______ (SCE), dated _________; Subject: __________

Attachment F

(Proposed Technical Specification Pages, Unit 3)

3.7 PLANT SYSTEMS

3.7.17 Fuel Storage Pool Boron Concentration

LCO 3.7.17 The fuel storage pool boron concentration shall be ≥ 2000 ppm.

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

ACTIONS

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

3.7 PLANT SYSTEMS

3.7.18 Spent Fuel Assembly Storage

LCO 3.7.18 The storage of SONGS Units 1, 2, and 3 fuel assemblies in the spent fuel storage racks shall be in accordance with Technical Specification 5.5.2.16, "Fuel Storage Program."

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

ACTIONS

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

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.18.1	Verify by administrative means the initial enrichment, burnup, and cooling time of the fuel assembly are in accordance with LCO 3.7.18.	Prior to storing the fuel assembly in Region I or II

FIGURE DELETED

FIGURE DELETED

4.0 DESIGN FEATURES (continued)

4.3 Fuel Storage

4.3.1 Criticality

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

a. Fuel assemblies having a maximum nominal U-235 enrichment of 4.8 weight percent;

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

c. $K_{eff} \leq 0.95$ if fully flooded with water borated to 1700 ppm, which includes an allowance for uncertainties as described in Section 9.1 of the UFSAR;

d. A nominal 8.85 inch center to center distance between fuel assemblies placed in Region II;

e. A nominal 10.40 inch center to center distance between fuel assemblies placed in Region I; and

f. Units 1, 2, and 3 fuel assemblies shall be stored in accordance with Technical Specification 5.5.2.16, "Fuel Storage Program."

(continued)

5.5.2.15 Containment Leakage Rate Testing Program (Continued)

The provisions of Surveillance Requirement 3.0.2 do not apply to the test frequencies specified in the Containment Leakage Rate Testing Program. However, test frequencies specified in this Program may be extended consistent with the guidance provided in NEI 94-01, "Industry Guideline For Implementing Performance-Based Option Of 10CFR 50, Appendix J," as endorsed by Regulatory Guide 1.163. Specifically, NEI 94-01 has these provisions for test frequencies extension:

1. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for recommended Type A testing may be extended by up to 15 months. This option should be used only in cases where refueling schedules have been changed to accommodate other factors.

2. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for the recommended surveillance frequency for Type B and Type C testing may be extended by up to 25 percent of the test interval, not to exceed 15 months.

The provisions of Surveillance Requirement 3.0.3 are applicable to the Containment Leakage Rate Testing Program.

5.5.2.16 Fuel Storage Program

a. A program shall be established to provide safe storage of fuel assemblies in the SONGS Units 2 and 3 spent fuel storage racks assuming no Boraflex, and taking credit for soluble boron in the spent fuel pool water.

   The program, in conjunction with Technical Specifications 3.7.17, "Fuel Storage Boron Concentration," 3.7.18, "Spent Fuel Assembly Storage," and 4.3, "Fuel Storage," shall assure that:

   (1) Under normal conditions, the 95/95 neutron multiplication factor (K_{eff}), including all uncertainties, shall be less than 1.0 when flooded with unborated water.

   (2) Under normal and accident conditions, the 95/95 neutron multiplication factor (K_{eff}), including all uncertainties, shall be less than or equal to 0.95 when flooded with borated water.

(continued)

5.5 Procedures, Programs, and Manuals (continued)

5.5.2.16 Fuel Storage Program (continued)

b. The storage requirements, based on initial enrichment, burnup data, and cooling time (which determines plutonium decay) shall be contained in a program document previously approved by the NRC. SONGS Units 2 and 3 fuel storage pool shall be maintained in accordance with: "Fuel Storage Program (Assuming No Boraflex) San Onofre Nuclear Generating Station Units 2 and 3, February 2002" approved by the NRC Safety Evaluation Report transmitted in a letter from ______ (NRC) to _______ (SCE), dated _________; Subject: __________

Attachment G

(Proposed Bases Pages (For Information Only) Unit 2)

B 3.7 PLANT SYSTEMS

B 3.7.17 Fuel Storage Pool Boron Concentration

BASES

BACKGROUND

As described in LCO 3.7.18, "Spent Fuel Assembly Storage," fuel assemblies are stored in the spent fuel racks in accordance with criteria based on initial enrichment, ~~and~~ discharge burnup, and cooling time (plutonium decay). Although the water in the spent fuel pool is normally borated to ≥ ~~1850~~ 2000 ppm, the criteria that limit the storage of a fuel assembly to specific rack locations is conservatively developed without taking credit for boron~~.~~ while maintaining K_{eff} < 1.0. Credit for boron is taken to maintain K_{eff} ≤ 0.95.

APPLICABLE SAFETY ANALYSES

A fuel assembly could be inadvertently loaded into a spent fuel rack location not allowed by LCO 3.7.18 (e.g., an unirradiated fuel assembly or an insufficiently depleted fuel assembly). ~~This accident is analyzed assuming the extreme case of completely loading the fuel pool racks with unirradiated assemblies of maximum enrichment. Another type of postulated accident is associated with a fuel assembly that is dropped onto the fully loaded fuel pool storage rack. Either incident could have a positive reactivity effect, decreasing the margin to criticality.~~ However, the negative reactivity effect of the soluble boron compensates for the increased reactivity caused by ~~either one of~~ the ~~two~~ postulated accident scenario~~s~~.

Under normal, non-accident conditions, the soluble boron needed to maintain K_{eff} less than or equal to 0.95, including uncertainties, is 970 ppm. Under accident conditions, the soluble boron needed to maintain K_{eff} less than or equal to 0.95, including uncertainties, is 1700 ppm. A SFP boron dilution analysis shows that dilution from 2000 ppm to 1700 is not credible. Therefore, the minimum required soluble boron concentration is 2000 ppm.

The concentration of dissolved boron in the fuel pool satisfies Criterion 2 of the NRC Policy Statement.

(continued)

BASES (continued)

LCO

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

APPLICABILITY

This LCO applies whenever fuel assemblies are stored in the spent fuel pool. ~~until a complete spent fuel pool verification has been performed following the last movement of fuel assemblies in the spent fuel pool. This LCO does not apply following the verification since the verification would confirm that there are no misloaded fuel assemblies. With no further fuel assembly movements in progress, there is no potential for a misloaded fuel assembly or a dropped fuel assembly.~~

ACTIONS

A.1, A.2, and A.3

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

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

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

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.7.17.1

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

REFERENCES

1. UFSAR, Section 9.1.

B 3.7 PLANT SYSTEMS

B 3.7.18 Spent Fuel Assembly Storage

BASES

BACKGROUND

The spent fuel storage facility is designed to store either new (nonirradiated) nuclear fuel assemblies, or burned (irradiated) fuel assemblies in a vertical configuration underwater. The storage pool is sized to store 1542 fuel assemblies. Two types/sizes of spent fuel storage racks are used (Region I and Region II). The two Region I racks each contain 156 storage locations each spaced 10.40 inches on center in a 12x13 array. Four Region II storage racks each contain 210 storage locations in a 14x15 array. The remaining two Region II racks each contain 195 locations in a 13x15 array. All Region II locations are spaced 8.85 inches on center. ~~This spacing and "flux trap" construction, whereby the fuel assemblies are inserted into neutron absorbing stainless steel cans, is sufficient to maintain a k_{eff} of $\leq$ 0.95 for spent fuel of original enrichment of up to 4.1%. However, as higher initial enrichment fuel assemblies are stored in the spent fuel pool, they must be stored in a checkerboard pattern taking into account fuel burnup to maintain a k_{eff} of 0.95 or less.~~

To maintain $K_{eff} \leq 0.95$ for spent fuel of nominal enrichment up to 4.8 w/o, (1) soluble boron is credited, and (2) the following storage patterns and guide tube inserts are used as needed:

(1) unrestricted storage, minimum discharge burnup and cooling time requirements vs. initial enrichment,

(2) SFP Peripheral storage, minimum discharge burnup and cooling time requirements vs initial enrichment,

(3) 2x2 storage patterns, minimum discharge burnup and cooling time requirements vs initial enrichment,

(4) 3x3 storage patterns, minimum discharge burnup and cooling time requirements vs initial enrichment,

(continued)

BASES (continued)

BACKGROUND (continued)

(5) credit for inserted Control Element Assemblies (CEAs),

(6) credit for erbia in fresh assemblies,

(7) credit for cooling time (Pu-241 decay), and,

(8) credit for borated stainless steel and borated aluminum guide tube inserts.

When soluble boron is credited, the following acceptance criteria apply:

(1) Under normal conditions, the 95/95 neutron multiplication factor (K_{eff}), including all uncertainties, shall be less than 1.0 when flooded with unborated water, and,

(2) Under normal and accident conditions, the 95/95 neutron multiplication factor (K_{eff}), including all uncertainties, shall be less than or equal to 0.95 when flooded with borated water.

APPLICABLE SAFETY ANALYSES

The spent fuel storage facility is designed for noncriticality by use of adequate spacing, ~~and "flux trap" construction whereby the fuel assemblies are inserted into~~ neutron absorbing stainless steel cans~~.~~, and storage of fuel assemblies in accordance with the administrative controls in Technical Specification 5.5.2.16, "Fuel Storage Program".

The spent fuel assembly storage satisfies Criterion 2 of the NRC Policy Statement.

LCO

The restrictions on the placement of fuel assemblies within the spent fuel pool, according to ~~Figure 3.7.18-1 and Figure 3.7.18-2~~ Technical Specification 5.5.2.16, in the accompanying LCO, ensure~~s~~ that the K_{eff} of the spent fuel pool will always remain < ~~0.95~~ 1.00 under normal, non-accident conditions assuming the pool to be flooded with unborated water. The K_{eff} of the spent fuel pool will always remain < 0.95 under normal, non-accident conditions assuming the pool to be flooded with

(continued)

BASES (continued)

LCO (continued)

borated water with a minimum soluble boron concentration of 970 ppm. The K_{eff} of the spent fuel pool will always remain < 0.95 under accident conditions assuming the pool to be flooded with borated water with a minimum soluble boron concentration of 1700 ppm. The restrictions are consistent with the criticality safety analysis performed for the spent fuel pool. ~~according to LCO Figure 3.7.18-1 and Figure 3.7.18-2, in the accompanying LCO. Fuel assemblies not meeting the criteria of Figure 3.7.18-1 and Figure 3.7.18-2 shall be stored in accordance with Specification 4.3.1.1.~~

APPLICABILITY

This LCO applies whenever any fuel assembly is stored in Regions I and II of the spent fuel pool.

ACTIONS

A.1

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

When the configuration of fuel assemblies stored in Regions I and II of the spent fuel pool is not in accordance with ~~Figure 3.7.18-1 and Figure 3.7.18-2~~ Technical Specification 5.5.2.16, immediate action must be taken to make the necessary fuel assembly movement(s) to bring the configuration into compliance with ~~Figure 3.7.18-1 and Figure 3.7.18-2~~ Technical Specification 5.5.2.16.

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

SURVEILLANCE REQUIREMENTS

SR 3.7.18.1

This SR verifies by administrative means that ~~the initial enrichment and burnup of~~ the fuel assembly is stored in accordance with ~~Figure 3.7.18-1 and Figure 3.7.18-2~~ Technical Specification 5.5.2.16, "Fuel Storage Program" in the accompanying LCO. For fuel assemblies ~~in the unacceptable range of Figure 3.7.18-1 and Figure 3.7.18-2~~ not stored in accordance with Technical Specification 5.5.2.16, performance of this SR will ensure compliance with ~~Specification 4.3.1.1~~ Technical Specification 5.5.2.16.

REFERENCES

UFSAR, Section 9.1.2.2.

Attachment H

(Proposed Bases Pages (For Information Only) Unit 3)

B 3.7 PLANT SYSTEMS

B 3.7.17 Fuel Storage Pool Boron Concentration

BASES

BACKGROUND

As described in LCO 3.7.18, "Spent Fuel Assembly Storage," fuel assemblies are stored in the spent fuel racks in accordance with criteria based on initial enrichment, ~~and~~ discharge burnup, and cooling time (plutonium decay). Although the water in the spent fuel pool is normally borated to ≥ ~~1850~~ 2000 ppm, the criteria that limit the storage of a fuel assembly to specific rack locations is conservatively developed without taking credit for boron~~,~~ while maintaining $K_{eff} < 1.0$. Credit for boron is taken to maintain $K_{eff} \leq 0.95$.

APPLICABLE SAFETY ANALYSES

A fuel assembly could be inadvertently loaded into a spent fuel rack location not allowed by LCO 3.7.18 (e.g., an unirradiated fuel assembly or an insufficiently depleted fuel assembly). ~~This accident is analyzed assuming the extreme case of completely loading the fuel pool racks with unirradiated assemblies of maximum enrichment. Another type of postulated accident is associated with a fuel assembly that is dropped onto the fully loaded fuel pool storage rack. Either incident could have a positive reactivity effect, decreasing the margin to criticality.~~ However, the negative reactivity effect of the soluble boron compensates for the increased reactivity caused by ~~either one of~~ the ~~two~~ postulated accident scenario~~s~~.

Under normal, non-accident conditions, the soluble boron needed to maintain K_{eff} less than or equal to 0.95, including uncertainties, is 970 ppm. Under accident conditions, the soluble boron needed to maintain K_{eff} less than or equal to 0.95, including uncertainties, is 1700 ppm. A SFP boron dilution analysis shows that dilution from 2000 ppm to 1700 is not credible. Therefore, the minimum required soluble boron concentration is 2000 ppm.

The concentration of dissolved boron in the fuel pool satisfies Criterion 2 of the NRC Policy Statement.

(continued)

BASES (continued)

LCO

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

APPLICABILITY

This LCO applies whenever fuel assemblies are stored in the spent fuel pool.~~until a complete spent fuel pool verification has been performed following the last movement of fuel assemblies in the spent fuel pool. This LCO does not apply following the verification since the verification would confirm that there are no misloaded fuel assemblies. With no further fuel assembly movements in progress, there is no potential for a misloaded fuel assembly or a dropped fuel assembly.~~

ACTIONS

A.1, A.2, and A.3

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

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

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

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.7.17.1

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

REFERENCES

1. UFSAR, Section 9.1.

B 3.7 PLANT SYSTEMS

B 3.7.18 Spent Fuel Assembly Storage

BASES

BACKGROUND

The spent fuel storage facility is designed to store either new (nonirradiated) nuclear fuel assemblies, or burned (irradiated) fuel assemblies in a vertical configuration underwater. The storage pool is sized to store 1542 fuel assemblies. Two types/sizes of spent fuel storage racks are used (Region I and Region II). The two Region I racks each contain 156 storage locations each spaced 10.40 inches on center in a 12x13 array. Four Region II storage racks each contain 210 storage locations in a 14x15 array. The remaining two Region II racks each contain 195 locations in a 13x15 array. All Region II locations are spaced 8.85 inches on center. ~~This spacing and "flux trap" construction, whereby the fuel assemblies are inserted into neutron absorbing stainless steel cans, is sufficient to maintain a k_{eff} of $\leq$ 0.95 for spent fuel of original enrichment of up to 4.1%. However, as higher initial enrichment fuel assemblies are stored in the spent fuel pool, they must be stored in a checkerboard pattern taking into account fuel burnup to maintain a k_{eff} of 0.95 or less.~~

To maintain $K_{eff} \leq 0.95$ for spent fuel of nominal enrichment up to 4.8 w/o, (1) soluble boron is credited, and (2) the following storage patterns and guide tube inserts are used as needed:

(1) unrestricted storage, minimum discharge burnup and cooling time requirements vs. initial enrichment,

(2) SFP Peripheral storage, minimum discharge burnup and cooling time requirements vs initial enrichment,

(3) 2x2 storage patterns, minimum discharge burnup and cooling time requirements vs initial enrichment,

(4) 3x3 storage patterns, minimum discharge burnup and cooling time requirements vs initial enrichment,

(continued)

BASES (continued)

BACKGROUND (continued)

(5) credit for inserted Control Element Assemblies (CEAs),

(6) credit for erbia in fresh assemblies,

(7) credit for cooling time (Pu-241 decay), and,

(8) credit for borated stainless steel and borated aluminum guide tube inserts.

When soluble boron is credited, the following acceptance criteria apply:

(1) Under normal conditions, the 95/95 neutron multiplication factor (K_{eff}), including all uncertainties, shall be less than 1.0 when flooded with unborated water, and,

(2) Under normal and accident conditions, the 95/95 neutron multiplication factor (K_{eff}), including all uncertainties, shall be less than or equal to 0.95 when flooded with borated water.

APPLICABLE SAFETY ANALYSES

The spent fuel storage facility is designed for noncriticality by use of adequate spacing, ~~and "flux trap" construction whereby the fuel assemblies are inserted into~~ neutron absorbing stainless steel cans~~.~~, and storage of fuel assemblies in accordance with the administrative controls in Technical Specification 5.5.2.16, "Fuel Storage Program".

The spent fuel assembly storage satisfies Criterion 2 of the NRC Policy Statement.

LCO

The restrictions on the placement of fuel assemblies within the spent fuel pool, according to ~~Figure 3.7.18-1 and Figure 3.7.18-2~~ Technical Specification 5.5.2.16, in the accompanying LCO, ensure~~s~~ that the K_{eff} of the spent fuel pool will always remain < ~~0.95~~ 1.00 under normal, non-accident conditions assuming the pool to be flooded with unborated water. The K_{eff} of the spent fuel pool will always remain < 0.95 under normal, non-accident conditions assuming the pool to be flooded with

(continued)

BASES (continued)

LCO (continued

borated water with a minimum soluble boron concentration of 970 ppm. The K_{eff} of the spent fuel pool will always remain < 0.95 under accident conditions assuming the pool to be flooded with borated water with a minimum soluble boron concentration of 1700 ppm. The restrictions are consistent with the criticality safety analysis performed for the spent fuel pool. ~~according to LCO Figure 3.7.18-1 and Figure 3.7.18-2, in the accompanying LCO. Fuel assemblies not meeting the criteria of Figure 3.7.18-1 and Figure 3.7.18-2 shall be stored in accordance with Specification 4.3.1.1.~~

APPLICABILITY

This LCO applies whenever any fuel assembly is stored in Regions I and II of the spent fuel pool.

ACTIONS

A.1

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

When the configuration of fuel assemblies stored in Regions I and II of the spent fuel pool is not in accordance with ~~Figure 3.7.18-1 and Figure 3.7.18-2~~ Technical Specification 5.5.2.16, immediate action must be taken to make the necessary fuel assembly movement(s) to bring the configuration into compliance with ~~Figure 3.7.18-1 and Figure 3.7.18-2~~ Technical Specification 5.5.2.16.

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

SURVEILLANCE REQUIREMENTS

SR 3.7.18.1

This SR verifies by administrative means that ~~the initial enrichment and burnup of~~ the fuel assembly is stored in accordance with ~~Figure 3.7.18-1 and Figure 3.7.18-2~~ Technical Specification 5.5.2.16, "Fuel Storage Program" in the accompanying LCO. For fuel assemblies ~~in the unacceptable range of Figure 3.7.18-1 and Figure 3.7.18-2~~ not stored in accordance with Technical Specification 5.5.2.16, performance of this SR will ensure compliance with ~~Specification 4.3.1.1~~ Technical Specification 5.5.2.16.

REFERENCES

UFSAR, Section 9.1.2.2.

Attachment I

(Proposed Fuel Storage Program)

Fuel Storage Program
(Assuming No Boraflex)
San Onofre Nuclear Generating Station
Units 2 And 3

February 2002

Southern California Edison
Nuclear Fuel Division

TABLE OF CONTENTS

1. INTRODUCTION

The fuel storage program[1] described herein provides requirements to ensure the safe storage of fuel assemblies in the SONGS Units 2 and 3 spent fuel storage racks assuming no Boraflex, and taking credit for soluble boron in the spent fuel pool water.

The fuel storage program described in this document has NRC approval, and will not be changed or modified in any way without NRC approval.

Boraflex erosion/dissolution is an industry problem, and SONGS Units 2 and 3 are affected. Silica levels in the SONGS Units 2 and 3 spent fuel pools are increasing, and this indicates the Boraflex is eroding/dissolving. Although there is currently sufficient Boraflex, it is prudent to plan for the long term. Taking no credit for Boraflex for SONGS Units 2 and 3 will totally eliminate any Boraflex concerns in the future, and monitoring programs to ensure that an adequate amount of Boraflex is present will not be needed.

2. ACCEPTANCE CRITERIA

When credit for soluble boron is taken, the criticality acceptance criteria are:

(1) Under normal conditions, the 95/95 neutron multiplication factor (K_{eff}), including all uncertainties, shall be less than 1.0 when flooded with unborated water.

(2) Under normal and accident conditions, the 95/95 neutron multiplication factor (K_{eff}), including all uncertainties, shall be less than or equal to 0.95 when flooded with borated water.

3. STORAGE OF SONGS UNITS 2 AND 3 FUEL ASSEMBLIES AND COMPONENTS

3.1 SONGS Units 2 And 3 Fuel Assemblies

Storage of SONGS Units 2 and 3 fuel assemblies in accordance with Tables I-1 through II-15 and Figures I-1 through II-22 provides safe storage. Specifically, the spent fuel rack neutron multiplication factor (K_{eff}) is less than 0.95 under all normal and accident conditions, including all uncertainties, provided that a minimum boron concentration of 1,700 ppm is maintained in the spent fuel pool water at all times. However, as described in Reference 2, the soluble boron concentration in the SFP must be greater than or equal to 2000 ppm to cover an accident condition and a concurrent boron dilution event.

To meet the acceptance criteria when flooded with unborated water and assuming no Boraflex, the following criteria, storage patterns and guide tube inserts, and neutron poisons have been considered:

(1) unrestricted storage, minimum discharge burnup and cooling time requirements vs initial enrichment,
(2) SFP Peripheral storage, minimum discharge burnup and cooling time requirements vs initial enrichment,
(3) 2x2 storage patterns, minimum discharge burnup and cooling time requirements vs initial enrichment,
(4) 3x3 storage patterns, minimum discharge burnup and cooling time requirements vs initial enrichment,
(5) credit for inserted Control Element Assemblies (CEAs),
(6) credit for erbia in fresh assemblies,
(7) credit for cooling time (Pu-241 decay), and,
(8) credit for borated stainless steel and borated aluminum guide tube inserts.

The spent fuel storage racks consist of two Regions. Region I is generally reserved for temporary storage of new fuel or partially irradiated fuel which would not qualify for Region II storage. Region II is generally used for normal, long term storage of permanently discharged fuel that has achieved qualifying burnup levels and/or cooling times.

Region I storage patterns are given in Tables I-1 through I-8 and Figures I-1 through I-9. Region II storage patterns are given in Tables II-1 through II-15 and Figures II-1 through II-19. Storage of fuel assemblies in accordance with these patterns ensures that K_{eff} is less than 0.95, including all uncertainties, under all normal and accident conditions.

The analysis methodology used in Reference 1 follows NRC guidance and Westinghouse Owners Group (WOG) methodology for spent fuel storage rack criticality analysis, which have been previously reviewed and approved by the NRC.(3, 4, 5, 7, 8) Recent methodology concerns regarding axial burnup bias(6) and equivalence of fresh fuel enrichment determined at 0 ppm being applied to cases with dissolved boron(9), have been explicitly addressed in Reference 1.

3.2 Design Requirements For Guide Tube Inserts

(A) Stainless Steel guide tube inserts shall be 0.75 inches O.D. minimum, completely cover the active fuel region (150 inches), and have a minimum boron content of 0.02434 grams of B-10 per cm^3.

(B) Aluminum guide tube inserts shall be 0.75 inches O.D. minimum, completely cover the active fuel region (150 inches), and have a minimum boron content of 0.06890 grams of B-10 per cm^3.

(C) Three (3) or 5 guide tube inserts are allowed. However, when 3 guide tube inserts are used, the orientation shall be the same in every assembly in the spent fuel pool (Figure II-20).

(D) A 5-finger, full-length Control Element Assembly (CEA) may be used in place of borated stainless steel or aluminum guide tube inserts.

3.3 Design requirements For Erbia

Assemblies containing 40 or 80 erbia rods shall have the erbia rods distributed per Figures II-21 and II-22. The minimum initial nominal erbia loading shall be 2.0 w/o Er_2O_3.

3.4 The Failed Fuel Rod Storage Basket (FFRSB)

The Failed Fuel Rod Storage Basket (FFRSB) shall be treated as if it were an assembly with enrichment and burnup of the rod in the basket with the most limiting combination of enrichment and burnup. Alternatively, explicit analyses using the methodology of Reference 1 may be performed to determine storage requirements for the FFRSB.

3.5 Non-Fuel Components

Neutron sources and non-fuel bearing assembly components (thimble plugs, CEAs, etc) may be stored in fuel assemblies without affecting the storage requirements of these assemblies. A storage basket containing no fissile material can be stored in any storage location, and can be used as a storage cell blocker for reactivity control.

3.6 Fuel Assembly Reconstitution Station

A fuel assembly reconstitution station is a special case of a checkerboard pattern. A reconstitution station is permitted anywhere in the Region I racks. The empty cells in the checkerboard pattern do not need to be blocked. A reconstitution station is permitted anywhere in the Region II racks provided that empty cells in the checkerboard pattern are blocked to make it impossible to misload a fuel assembly during reconstitution activities.

4. STORAGE OF SONGS UNIT 1 FUEL ASSEMBLIES

(A) SONGS Unit 1 Fuel is not analyzed for storage in Region I Racks. Therefore, SONGS Unit 1 Fuel shall not be stored in Region I Racks.

(B) The burnup of each SONGS Unit 1 uranium dioxide spent fuel assembly stored in Region II shall meet the following criteria:

(1) SONGS Unit 1 nominal 3.40 w/o assemblies can be stored in the Region II Racks (unrestricted) if:
the burnup is greater than 25,000 MWD/T, and
the cooling time is greater than 5 years.

(2) SONGS Unit 1 nominal 4.00 w/o assemblies can be stored in the Region II Racks (unrestricted) if:
the burnup is greater than 26,300 MWD/T, and
the cooling time is greater than 20 years.

the burnup is greater than 27,100 MWD/T, and
the cooling time is greater than 15 years.

the burnup is greater than 28,200 MWD/T, and
the cooling time is greater than 10 years.

(3) SONGS Unit 1 nominal 4.00 w/o assemblies can be stored in the Region II Racks (SFP periphery) if:
the burnup is greater than 20,000 MWD/T, and
the cooling time is greater than 0 years.

Table I-1

REGION I

Category I-1 Fuel
(Unrestricted Storage)

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU) 0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	22.84	21.47	20.59	20.04	19.67
4.50	18.61	17.57	16.89	16.45	16.17
4.00	14.30	13.58	13.09	12.78	12.57
3.50	9.84	9.40	9.11	8.92	8.79
3.00	5.24	5.02	4.91	4.84	4.79
2.47	0.00	0.00	0.00	0.00	0.00

Category I-1	Category I-1
Category I-1	Category I-1

Table I-2

REGION I

Category I-2 Fuel
(SFP Peripheral Storage)

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU) 0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	12.55	12.15	11.82	11.61	11.47
4.50	9.09	8.85	8.63	8.49	8.40
4.00	5.58	5.43	5.33	5.25	5.21
3.50	2.22	2.13	2.09	2.05	2.03
3.20	0.00	0.00	0.00	0.00	0.00

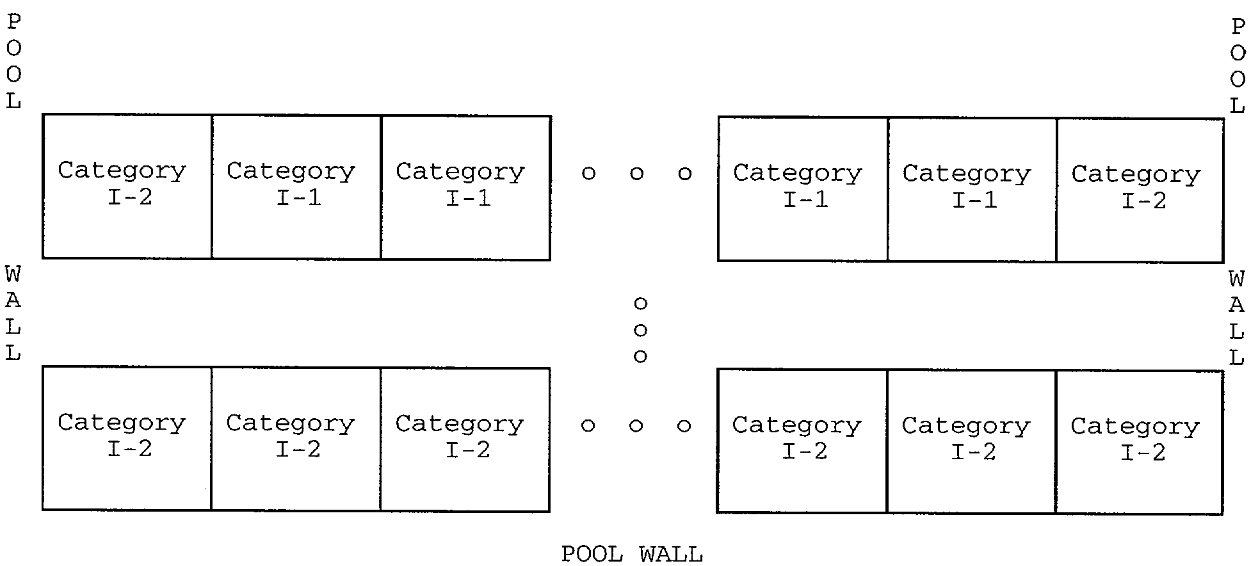


Table I-3

REGION I

Category I-3 Fuel
(Filler Assembly For 1-out-of-4 Pattern)

Initial Enrichment (w/o)	Minimum Burnup (GWD/T) 0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	39.99	36.28	34.27	33.04	32.22
4.50	34.95	31.71	29.94	28.84	28.12
4.00	29.71	26.99	25.46	24.51	23.89
3.50	24.22	22.03	20.79	20.02	19.52
3.00	18.37	16.84	15.91	15.34	14.97
2.50	12.21	11.30	10.72	10.37	10.13
2.00	5.28	5.05	4.85	4.72	4.62
1.71	0.00	0.00	0.00	0.00	0.00

4.80 Fresh	Category I-3
Category I-3	Category I-3

Table I-4

REGION I

4.80 w/o Fresh Fuel
Checkerboard Pattern

Initial Enrichment (w/o)	Minimum Burnup (GWD/T) 0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
4.80	0.00	0.00	0.00	0.00	0.00

4.80 Fresh	Empty
Empty	4.80 Fresh

Table I-5

REGION I

4.8 w/o Fresh Fuel With Full-Length, 5-Finger CEA
(Unrestricted Storage)

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU)				
	0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
4.80	0.00	0.00	0.00	0.00	0.00

4.80 Fresh With CEA	4.80 Fresh With CEA
4.80 Fresh With CEA	4.80 Fresh With CEA

Table I-6

REGION I

Category I-4 Fuel
(Filler Assembly For 1-out-of-4 Pattern)

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU) 0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	26.57	24.71	23.59	22.90	22.44
4.50	22.12	20.62	19.73	19.17	18.80
4.00	17.54	16.46	15.78	15.35	15.07
3.50	12.84	12.12	11.66	11.37	11.18
3.00	7.95	7.56	7.31	7.15	7.05
2.50	2.76	2.64	2.56	2.50	2.46
2.27	0.00	0.00	0.00	0.00	0.00

4.80 Fresh 80 Erbia	Category I-4
Category I-4	Category I-4

Table I-7

REGION I

Category I-5 Fuel
(Filler Assembly For 1-out-of-4 Pattern)

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU)				
	0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	30.81	28.40	27.00	26.14	25.57
4.50	26.17	24.17	22.99	22.26	21.78
4.00	21.32	19.77	18.84	18.27	17.88
3.50	16.32	15.22	14.55	14.13	13.85
3.00	11.11	10.45	10.05	9.79	9.61
2.50	5.55	5.30	5.14	5.04	4.98
2.07	0.00	0.00	0.00	0.00	0.00

4.80 Fresh 40 Erbia	Category I-5
Category I-5	Category I-5

Table I-8

REGION I

Checkerboard Pattern

Category I-6 Fuel
(4.80 w/o Assembly Depleted to 18.0 GWD/MTU)

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU) 0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	19.82	18.84	18.12	17.67	17.37
4.50	15.83	15.11	14.58	14.24	14.01
4.00	11.75	11.28	10.92	10.69	10.54
3.50	7.56	7.23	7.04	6.91	6.83
3.00	3.28	3.15	3.07	3.03	2.99
2.65	0.00	0.00	0.00	0.00	0.00

Category I-4 Fuel
(Checkerboard Partner For Category I-6 Fuel)

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU) 0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	26.57	24.71	23.59	22.90	22.44
4.50	22.12	20.62	19.73	19.17	18.80
4.00	17.54	16.46	15.78	15.35	15.07
3.50	12.84	12.12	11.66	11.37	11.18
3.00	7.95	7.56	7.31	7.15	7.05
2.50	2.76	2.64	2.56	2.50	2.46
2.27	0.00	0.00	0.00	0.00	0.00

Category I-4	Category I-6
Category I-6	Category I-4

Table II-1

REGION II

Category II-1 Fuel
(Unrestricted Storage)

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU) 0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	53.76	47.77	44.75	43.00	41.86
4.50	48.43	42.93	40.15	38.52	37.47
4.00	42.91	37.94	35.40	33.92	32.96
3.00	30.99	27.26	25.30	24.16	23.43
2.00	17.05	14.97	13.90	13.25	12.83
1.87	14.93	13.23	12.26	11.68	11.31
1.23	0.00	0.00	0.00	0.00	0.00

Category II-1	Category II-1
Category II-1	Category II-1

Note: Category II-1, II-8, and II-9 may be stored together with no restrictions.

Table II-2

REGION II

Category II-2 Fuel
(SFP Peripheral Storage)

Initial Enrichment (w/o)	Minimum Burnup GWD/MTU) 0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	36.95	33.68	31.89	30.81	30.10
4.50	32.29	29.44	27.87	26.91	26.28
4.00	27.44	25.04	23.70	22.88	22.35
3.00	16.95	15.62	14.83	14.34	14.03
2.00	4.93	4.67	4.52	4.42	4.35
1.87	3.04	2.87	2.76	2.69	2.64
1.70	0.00	0.00	0.00	0.00	0.00

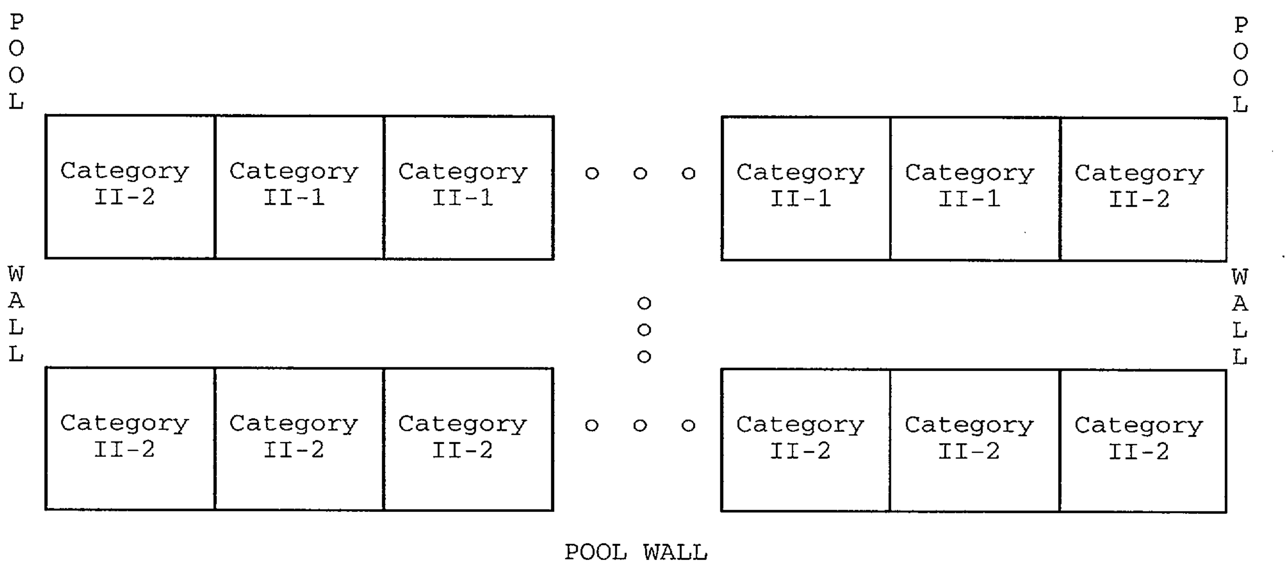


Table II-3

REGION II

Checkerboard Storage

Category II-3 Fuel
(Checkerboard Partner For Category II-4 Fuel)

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU)				
	0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	41.18	37.27	35.18	33.93	33.12
4.50	36.34	32.87	31.01	29.88	29.15
4.00	31.29	28.31	26.69	25.70	25.06
3.00	20.32	18.50	17.47	16.84	16.42
2.00	7.81	7.25	6.91	6.71	6.58
1.87	5.90	5.53	5.30	5.17	5.09
1.56	0.00	0.00	0.00	0.00	0.00

Category II-4 Fuel
(Checkerboard Partner For Category II-3 Fuel)

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU)				
	0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	75.42	61.90	56.85	54.18	52.60
4.50	68.08	56.12	51.65	49.25	47.76
4.00	60.74	50.35	46.44	44.19	42.78
3.00	46.06	38.80	35.41	33.52	32.31
2.00	31.38	25.71	23.12	21.65	20.71
1.87	29.19	23.83	21.34	19.91	19.08
0.94	0.00	0.00	0.00	0.00	0.00

Category II-4	Category II-3
Category II-3	Category II-4

Table II-4

REGION II

Checkerboard Storage

Category II-5 Fuel
(Checkerboard Partner For Category II-6 Fuel)

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU) 0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	47.50	42.58	40.03	38.53	37.55
4.50	42.40	37.95	35.64	34.26	33.37
4.00	37.10	33.16	31.10	29.86	29.06
3.00	25.64	22.89	21.40	20.52	19.95
2.00	12.29	11.10	10.42	10.01	9.75
1.87	10.24	9.35	8.80	8.46	8.25
1.38	0.00	0.00	0.00	0.00	0.00

Category II-6 Fuel
(Checkerboard Partner For Category II-5 Fuel)

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU) 0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	62.37	53.95	50.33	48.25	46.91
4.50	56.21	48.90	45.51	43.56	42.31
4.00	50.04	43.67	40.54	38.73	37.57
3.00	37.71	32.56	29.97	28.52	27.58
2.00	23.30	19.80	18.13	17.14	16.50
1.87	21.11	18.02	16.42	15.48	14.88
1.08	0.00	0.00	0.00	0.00	0.00

Category II-6	Category II-5
Category II-5	Category II-6

Table II-5

REGION II

Checkerboard Storage

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU)				
	0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
4.80	0.00	0.00	0.00	0.00	0.00

4.80 Fresh	Empty (Blocked)
Empty (Blocked)	4.80 Fresh

Table II-6

REGION II

Category II-7 Fuel
(3 Out Of 4 Pattern)

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU)				
	0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	34.20	31.35	29.74	28.76	28.12
4.50	29.67	27.21	25.82	24.97	24.41
4.00	24.94	22.92	21.75	21.05	20.59
3.00	14.79	13.76	13.13	12.73	12.47
2.00	3.16	3.00	2.90	2.83	2.79
1.87	1.21	1.14	1.09	1.06	1.04
1.80	0.00	0.00	0.00	0.00	0.00

Category II-7	Empty (Blocked)
Category II-7	Category II-7

Table II-7

REGION II

Category II-8 Fuel
(Fuel With 5 Guide Tube Inserts)
(Unrestricted Storage)

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU)				
	0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	37.68	34.53	32.72	31.61	30.88
4.50	32.61	29.90	28.33	27.36	26.72
4.00	27.33	25.10	23.78	22.97	22.43
3.00	15.86	14.76	14.06	13.61	13.32
2.00	2.04	1.97	1.89	1.84	1.81
1.90	0.00	0.00	0.00	0.00	0.00

Category II-8	Category II-8
Category II-8	Category II-8

Note: Category II-1, II-8, and II-9 may be stored together with no restrictions.

Table II-8

REGION II

Category II-9 Fuel
(Fuel With 3 Guide Tube Inserts)
(Unrestricted Storage)

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU)				
	0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	44.16	39.95	37.68	36.31	35.42
4.50	38.99	35.25	33.22	31.99	31.18
4.00	33.61	30.38	28.60	27.52	26.81
3.00	21.92	19.86	18.72	18.01	17.56
2.00	8.28	7.72	7.34	7.11	6.96
1.87	6.18	5.83	5.58	5.43	5.34
1.59	0.00	0.00	0.00	0.00	0.00

Category II-9	Category II-9
Category II-9	Category II-9

Note: Category II-1, II-8, and II-9 may be stored together with no restrictions.

Table II-9

REGION II

Category II-10 Fuel
(Filler Assembly With 5 Guide Tube Inserts)

Initial (w/o)	Minimum Burnup (GWD/MTU) 0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	80.09	65.66	60.12	57.45	55.68
4.50	72.13	59.43	54.55	52.02	50.33
4.00	64.18	53.19	48.98	46.58	44.98
3.00	48.27	40.72	37.16	35.03	33.75
2.00	32.35	26.59	23.79	22.25	21.25
1.03	0.00	0.00	0.00	0.00	0.00

Category II-10 (5 Inserts)	Category II-10 (5 Inserts)	Category II-10 (5 Inserts)
Category II-10 (5 Inserts)	4.80 Fresh	Category II-10 (5 Inserts)
Category II-10 (5 Inserts)	Category II-10 (5 Inserts)	Category II-10 (5 Inserts)

Table II-10

REGION II

Category II-11 Fuel
(Filler Assembly With 5 Guide Tube Inserts)

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU) 0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	47.04	42.52	40.05	38.57	37.60
4.50	41.62	37.58	35.36	34.02	33.14
4.00	35.97	32.46	30.50	29.32	28.54
3.00	23.70	21.42	20.09	19.31	18.79
2.00	9.17	8.54	8.09	7.81	7.62
1.59	0.00	0.00	0.00	0.00	0.00

Category II-11 (5 Inserts)	Category II-11 (5 Inserts)	Category II-11 (5 Inserts)
Category II-11 (5 Inserts)	4.80 Fresh 5 Inserts	Category II-11 (5 Inserts)
Category II-11 (5 Inserts)	Category II-11 (5 Inserts)	Category II-11 (5 Inserts)

Table II-11

REGION II

Category II-12 Fuel
(Filler Assembly With 3 Guide Tube Inserts)

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU) 0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	54.33	48.48	45.46	43.67	42.51
4.50	48.81	43.45	40.67	39.02	37.95
4.00	43.07	38.24	35.72	34.22	33.26
3.00	30.65	27.11	25.18	24.05	23.33
2.00	16.01	14.23	13.22	12.62	12.22
1.87	13.82	12.35	11.47	10.94	10.60
1.32	0.00	0.00	0.00	0.00	0.00

Category II-12 (3 Inserts)	Category II-12 (3 Inserts)	Category II-12 (3 Inserts)
Category II-12 (3 Inserts)	4.80 Fresh 5 Inserts	Category II-12 (3 Inserts)
Category II-12 (3 Inserts)	Category II-12 (3 Inserts)	Category II-12 (3 Inserts)

Table II-12

REGION II

Category II-13 Fuel
(Filler Assembly With No Guide Tube Inserts)

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU)				
	0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	64.24	55.51	51.59	49.41	48.03
4.50	57.99	50.23	46.73	44.67	43.38
4.00	51.75	44.94	41.71	39.79	38.59
3.00	39.25	33.75	31.05	29.48	28.50
2.00	24.76	20.95	19.07	18.01	17.33
1.87	22.64	19.10	17.38	16.37	15.72
1.05	0.00	0.00	0.00	0.00	0.00

Category II-13	Category II-13	Category II-13
Category II-13	4.80 Fresh 5 Inserts	Category II-13
Category II-13	Category II-13	Category II-13

Table II-13

REGION II

Category II-14 Fuel
(4.80 w/o Assembly Depleted to 18.0 GWD/MTU)

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU)				
	0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	19.59	18.61	17.96	17.54	17.27
4.50	15.93	15.17	14.68	14.36	14.15
4.00	12.18	11.64	11.29	11.07	10.93
3.00	4.28	4.12	4.05	4.00	3.98
2.51	0.00	0.00	0.00	0.00	0.00

Category II-13 Fuel
(Filler Assembly For Category II-14 Fuel)

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU)				
	0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	64.24	55.51	51.59	49.41	48.03
4.50	57.99	50.23	46.73	44.67	43.38
4.00	51.75	44.94	41.71	39.79	38.59
3.00	39.25	33.75	31.05	29.48	28.50
2.00	24.76	20.95	19.07	18.01	17.33
1.87	22.64	19.10	17.38	16.37	15.72
1.05	0.00	0.00	0.00	0.00	0.00

Category II-13	Category II-13	Category II-13
Category II-13	Category II-14	Category II-13
Category II-13	Category II-13	Category II-13

Table II-14

REGION II

Category II-14 Fuel
(4.80 w/o Assembly Depleted to 18.0 GWD/MTU)

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU) 0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	19.59	18.61	17.96	17.54	17.27
4.50	15.93	15.17	14.68	14.36	14.15
4.00	12.18	11.64	11.29	11.07	10.93
3.00	4.28	4.12	4.05	4.00	3.98
2.51	0.00	0.00	0.00	0.00	0.00

Category II-11 Fuel
(Filler Assembly With 5 Guide Tube Inserts)

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU) 0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	47.04	42.52	40.05	38.57	37.60
4.50	41.62	37.58	35.36	34.02	33.14
4.00	35.97	32.46	30.50	29.32	28.54
3.00	23.70	21.42	20.09	19.31	18.79
2.00	9.17	8.54	8.09	7.81	7.62
1.59	0.00	0.00	0.00	0.00	0.00

Category II-11 (5 Inserts)	Category II-11 (5 Inserts)	Category II-11 (5 Inserts)
Category II-11 (5 Inserts)	Category II-14	Category II-11 (5 Inserts)
Category II-11 (5 Inserts)	Category II-11 (5 Inserts)	Category II-11 (5 Inserts)

Table II-15

REGION II

Category II-15 Fuel
(Fuel With 5 Finger Full Length CEA)
(Unrestricted Storage)

Initial Enrichment (w/o)	Minimum Burnup (GWD/MTU)				
	0 Years Cooling	5 Years Cooling	10 Years Cooling	15 Years Cooling	20 Years Cooling
5.00	29.24	27.24	26.00	25.22	24.70
4.50	24.44	22.84	21.81	21.17	20.75
4.00	19.41	18.26	17.49	17.00	16.68
3.00	8.83	8.47	8.19	8.02	7.90
2.30	0.00	0.00	0.00	0.00	0.00

Category II-15	Category II-15
Category II-15	Category II-15

Figure I-1

REGION I

MINIMUM BURNUP FOR CATEGORY I-1 FUEL

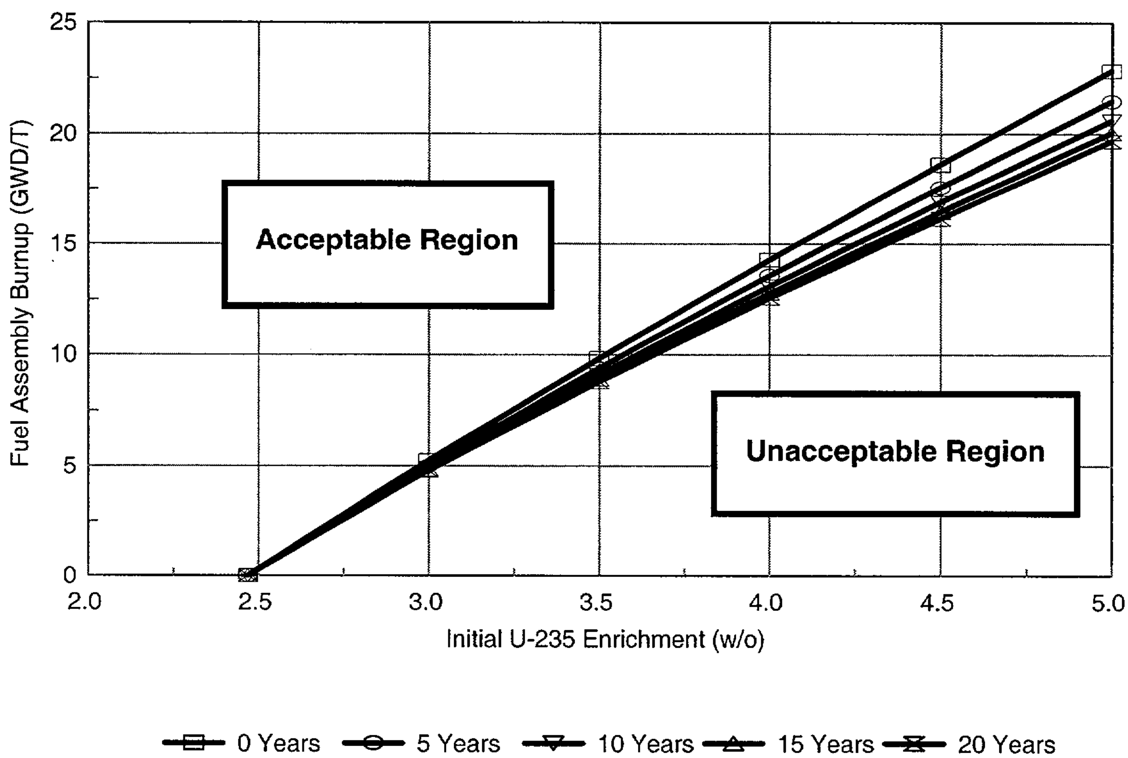


Figure I-2

REGION I

MINIMUM BURNUP FOR CATEGORY I-2 FUEL

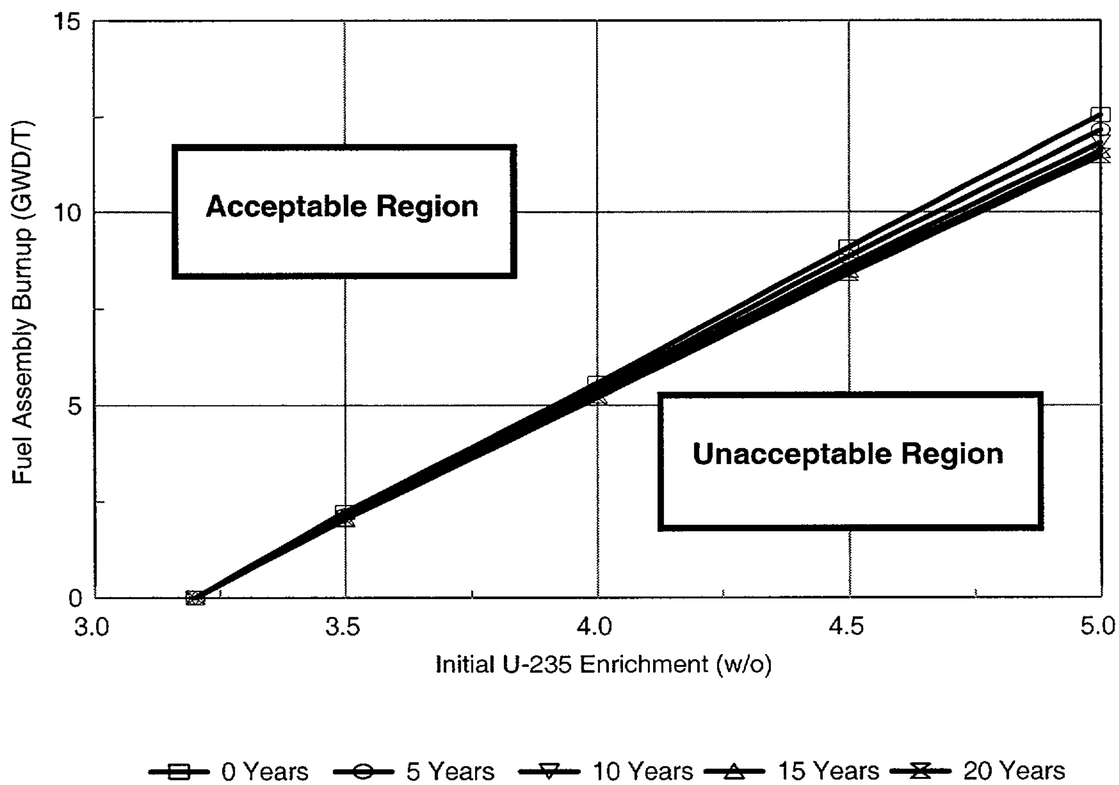


Figure I-3

REGION I

MINIMUM BURNUP FOR CATEGORY I-3 FUEL

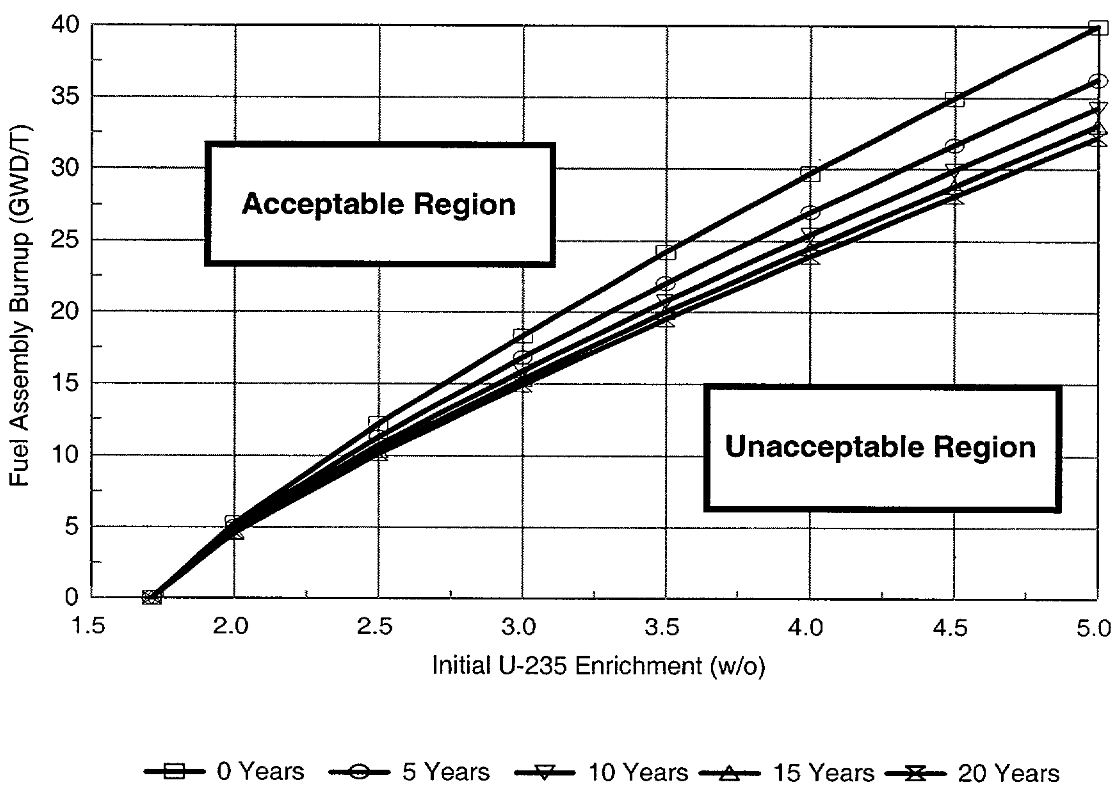


Figure I-4

REGION I

MINIMUM BURNUP FOR CATEGORY I-4 FUEL

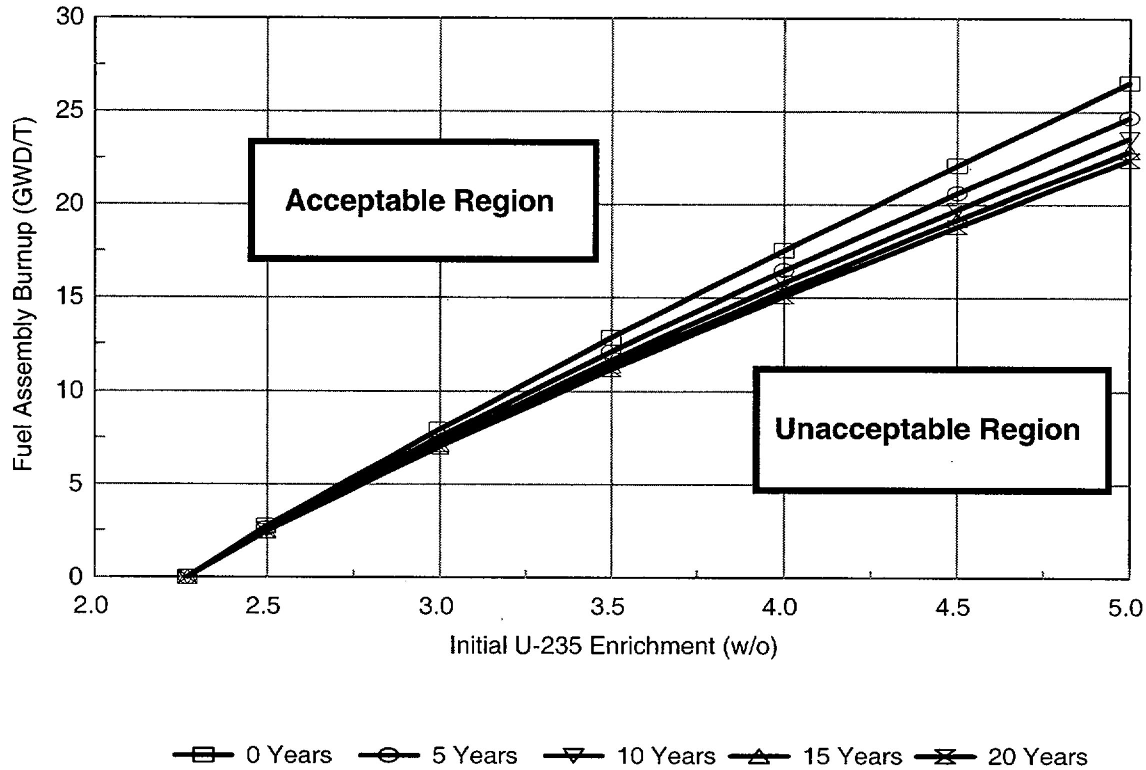


Figure I-5

REGION I

MINIMUM BURNUP FOR CATEGORY I-5 FUEL

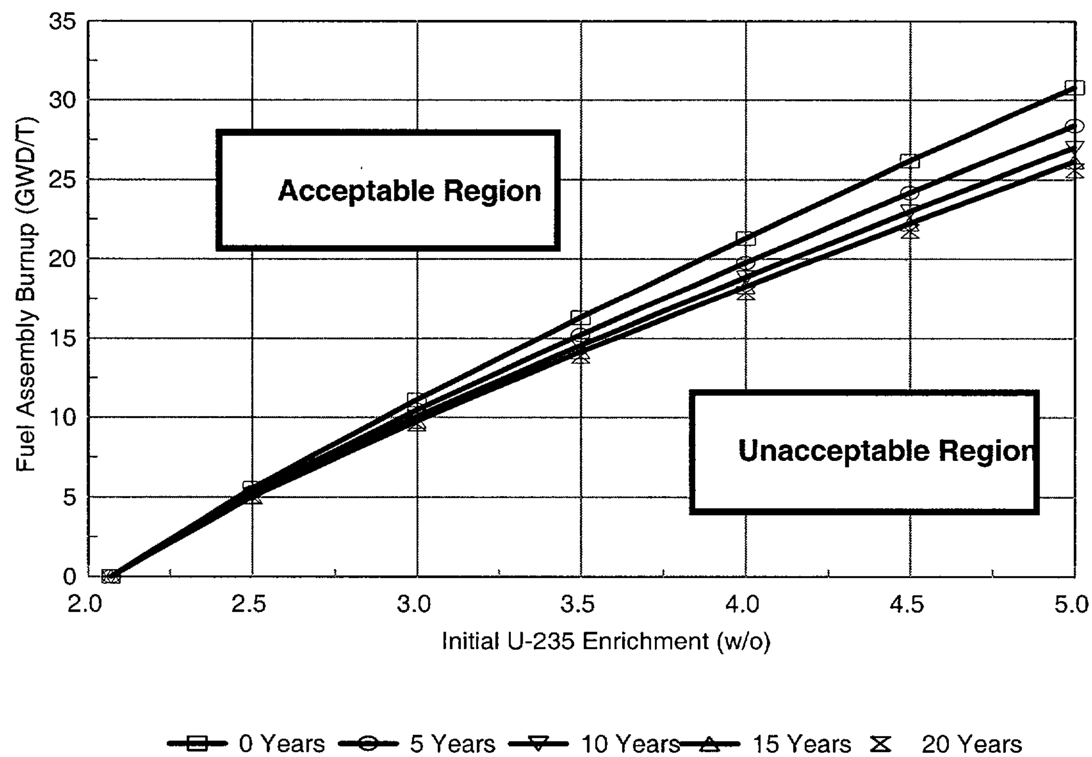


Figure I-6

REGION I

MINIMUM BURNUP FOR CATEGORY I-6 FUEL

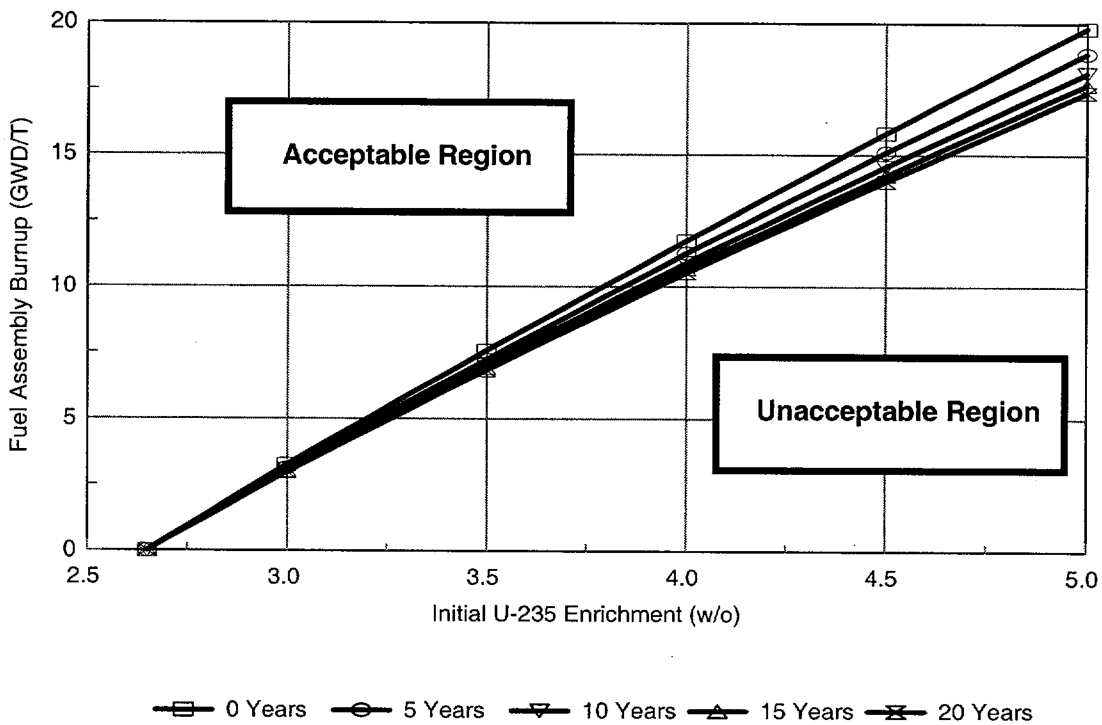


Figure I-7

REGION I

Boundary Between All Cell Storage And Checkerboard Storage

I-1	I-1	I-1	I-1	I-1	I-1
I-1	I-1	I-1	I-1	I-1	I-1
I-1	I-1	I-1	I-1	I-1	I-1
I-1	Empty	I-1	I-1	I-1	I-1
Empty	4.80	Empty	I-1	I-1	I-1
4.80	Empty	I-1	I-1	I-1	I-1

Interface

I-1	I-1	I-1	I-1	I-1	I-1
I-1	I-1	I-1	I-1	I-1	I-1
I-1	I-1	I-1	I-1	I-1	I-1
I-1	I-4	I-1	I-1	I-1	I-1
I-4	I-6	I-4	I-1	I-1	I-1
I-6	I-4	I-1	I-1	I-1	I-1

Interface

Note: (1) A row of empty cells can be used at the interface to separate the configurations
(2) It is acceptable to replace an assembly with an empty cell.

Figure I-8

REGION I

Boundary Between All Cell Storage And 1 Out Of 4 Storage

I-1	I-1	I-1	I-1	I-1	I-1
I-1	I-1	I-1	I-1	I-1	I-1
I-1	I-1	I-1	I-1	I-1	I-1
I-3	I-3	I-3	I-1	I-1	I-1
I-3	4.80	I-3	I-1	I-1	I-1
I-3	I-3	I-3	I-1	I-1	I-1

Interface

Note: (1) A row of empty cells can be used at the interface to separate the configurations

(2) It is acceptable to replace an assembly with an empty cell.

Figure I-9

REGION I

Boundary Between Checkerboard Storage And 1 Out Of 4 Storage

4.80	Empty	4.80	Empty	4.80	Empty
Empty	4.80	Empty	4.80	Empty	4.80
4.80	Empty	4.80	Empty	4.80	Empty
Empty	I-3	Empty	4.80	Empty	4.80
I-3	4.80	I-3	Empty	4.80	Empty
I-3	I-3	Empty	4.80	Empty	4.80

Interface

I-6	I-4	I-6	I-4	I-6	I-4
I-4	I-6	I-4	I-6	I-4	I-6
I-6	I-4	I-6	I-4	I-6	I-4
I-3	I-3	I-3	I-6	I-4	I-6
I-3	4.80	I-3	I-4	I-6	I-4
I-3	I-3	I-3	I-6	I-4	I-6

Interface

Note: (1) A row of empty cells can be used at the interface to separate the configurations
(2) It is acceptable to replace an assembly with an empty cell.

Figure II-1

REGION II

MINIMUM BURNUP FOR CATEGORY II-1 FUEL

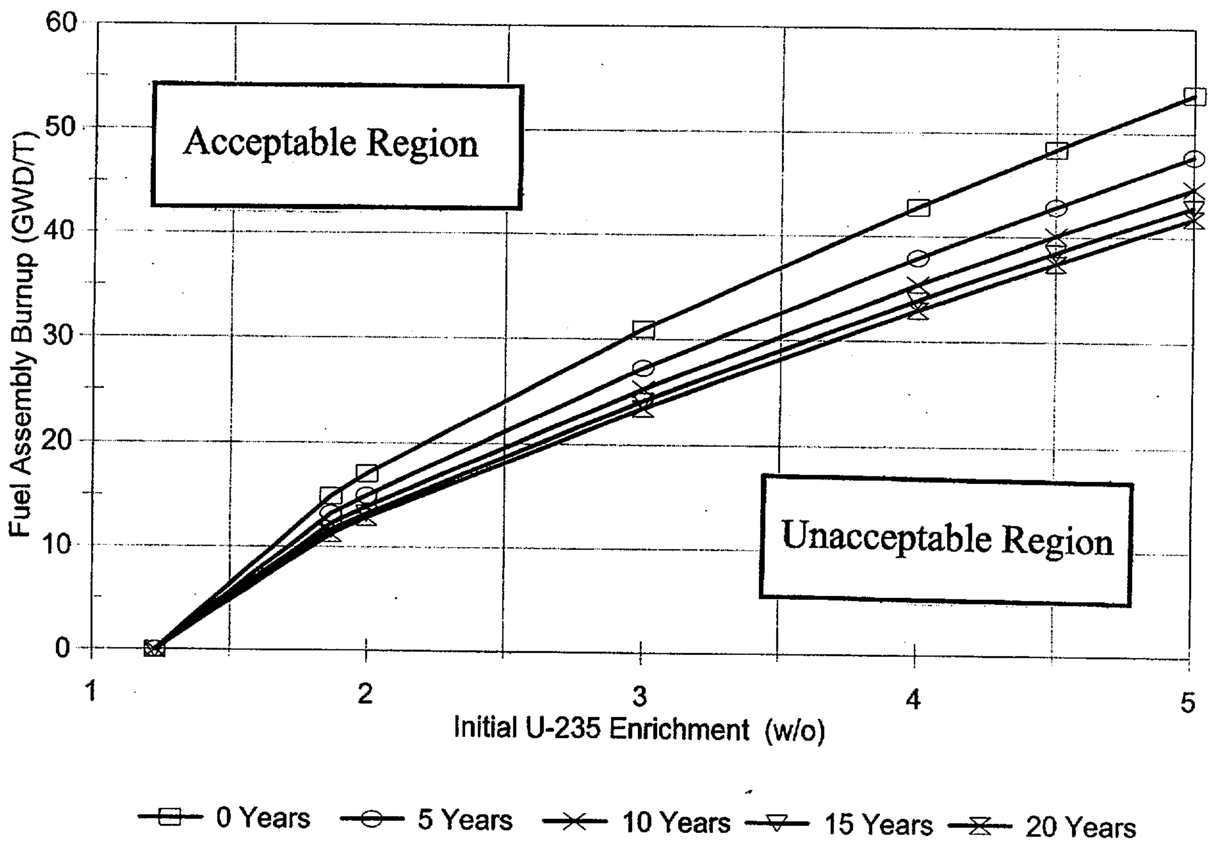


Figure II-2

REGION II

MINIMUM BURNUP FOR CATEGORY II-2 FUEL

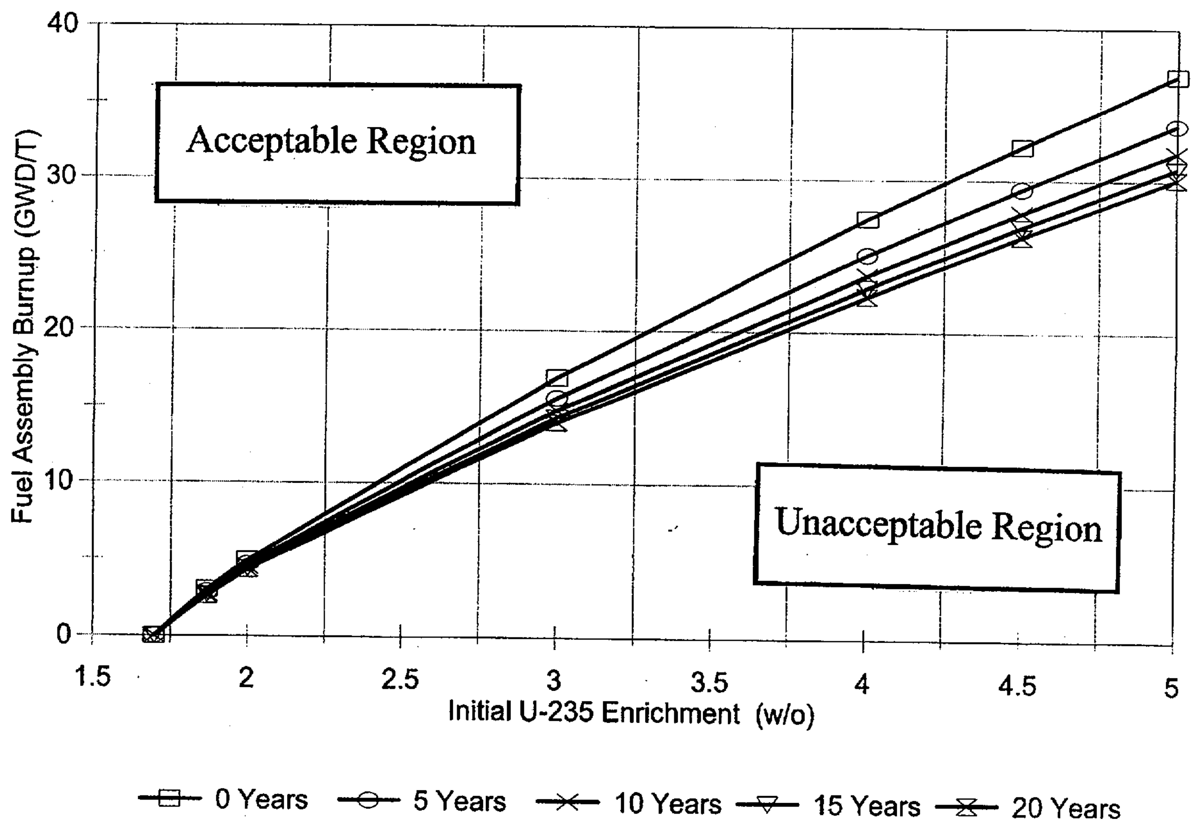


Figure II-3

REGION II

MINIMUM BURNUP FOR CATEGORY II-3 FUEL

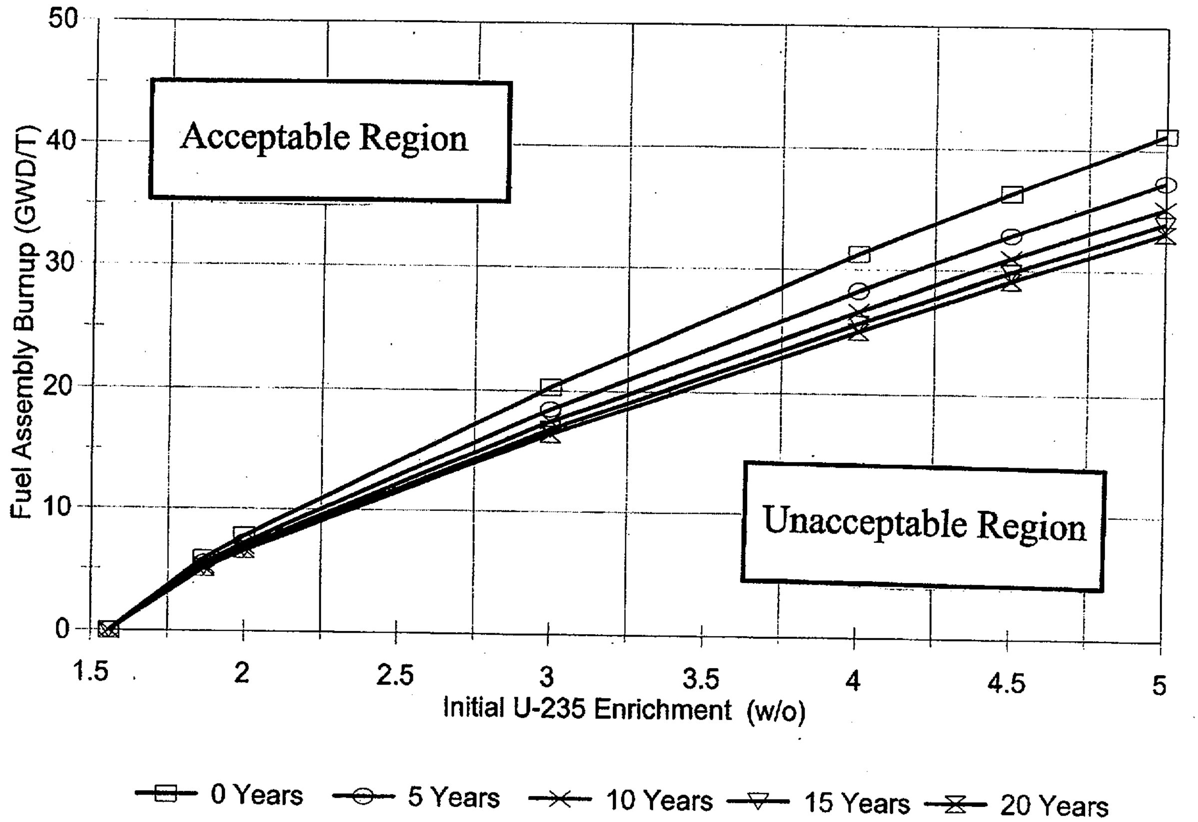


Figure II-4

REGION II

MINIMUM BURNUP FOR CATEGORY II-4 FUEL

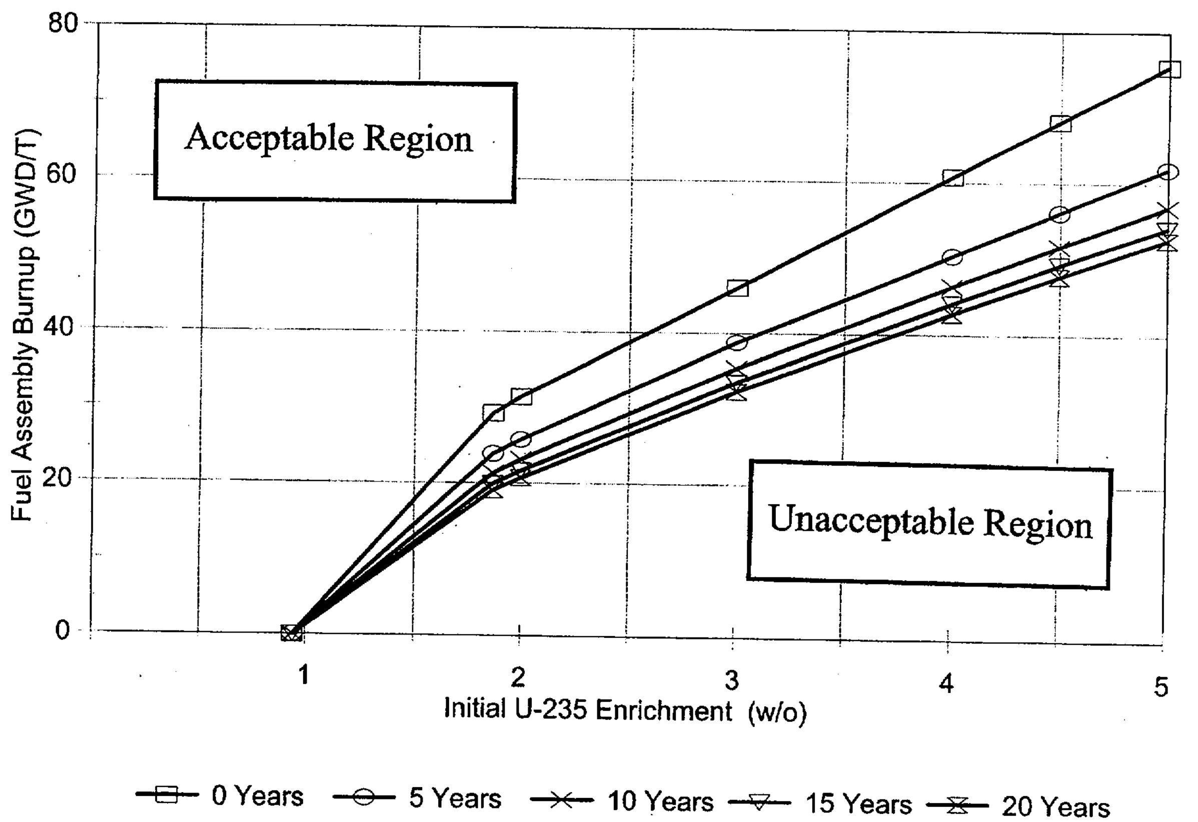


Figure II-5

REGION II

MINIMUM BURNUP FOR CATEGORY II-5 FUEL

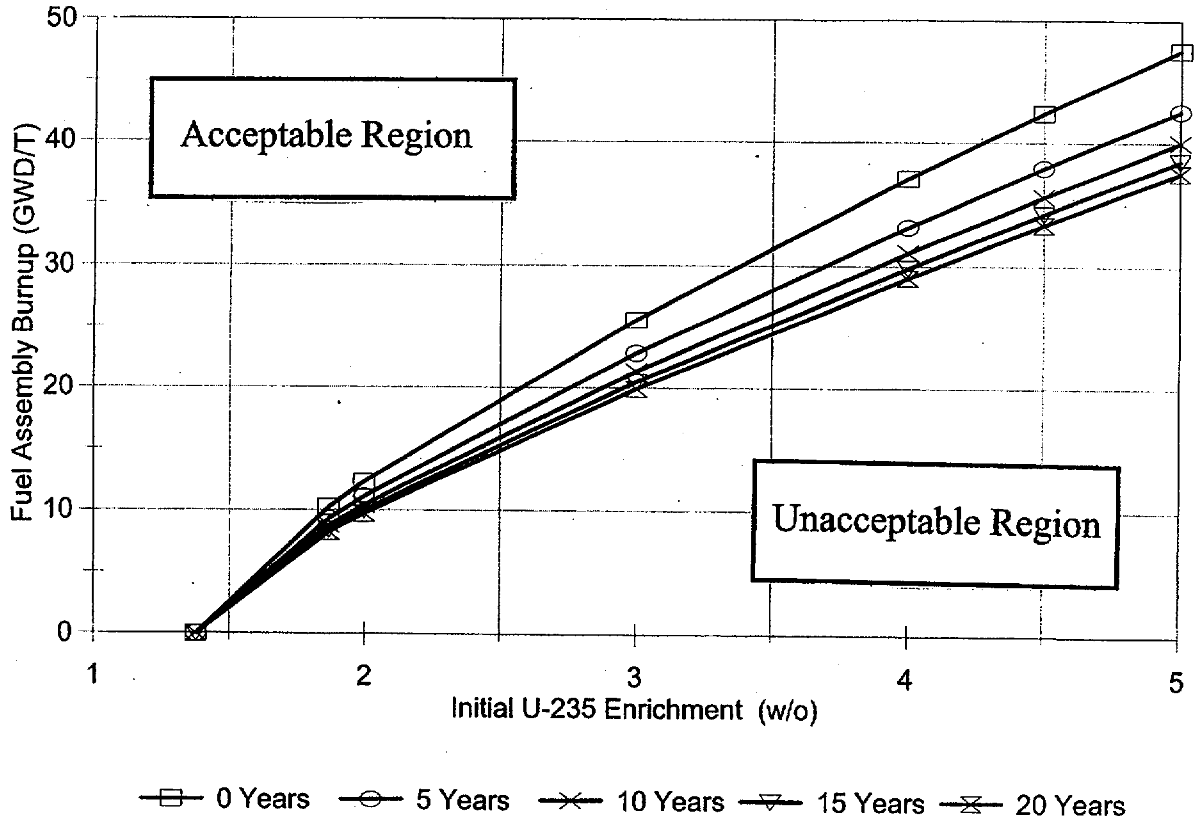


Figure II-6

REGION II

MINIMUM BURNUP FOR CATEGORY II-6 FUEL

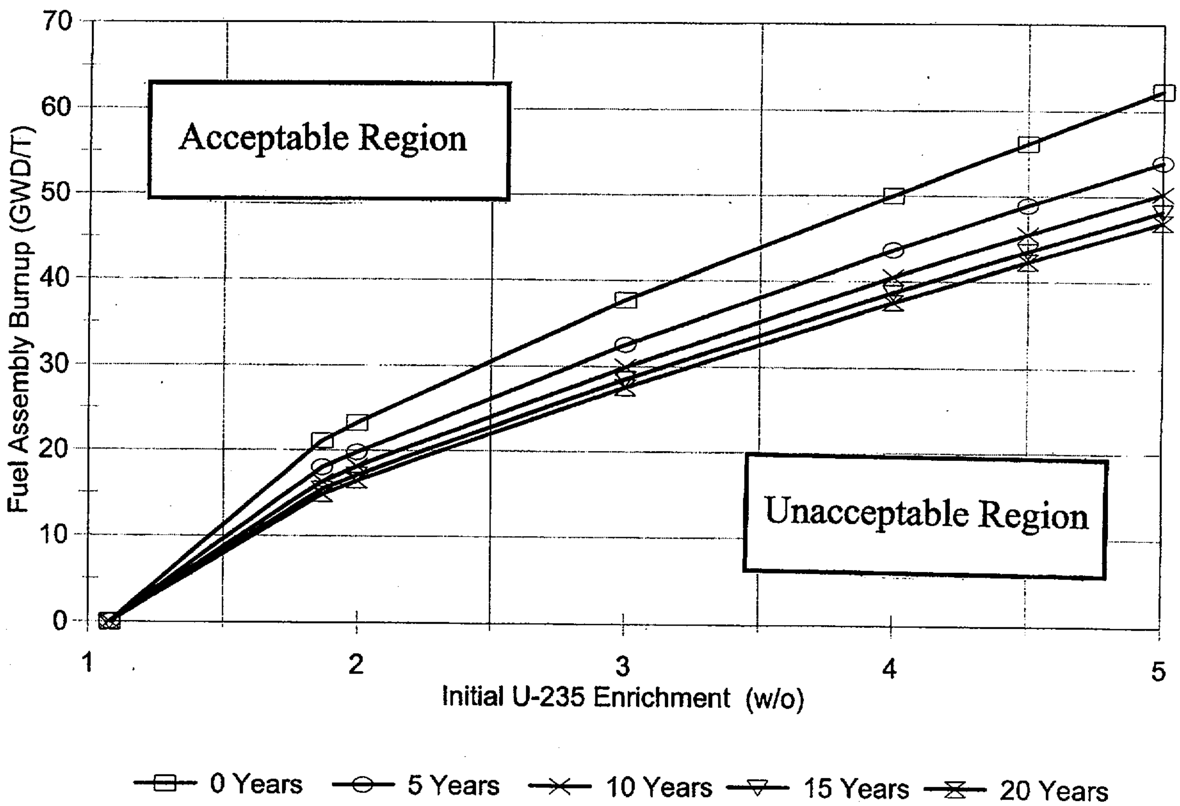


Figure II-7

REGION II

MINIMUM BURNUP FOR CATEGORY II-7 FUEL

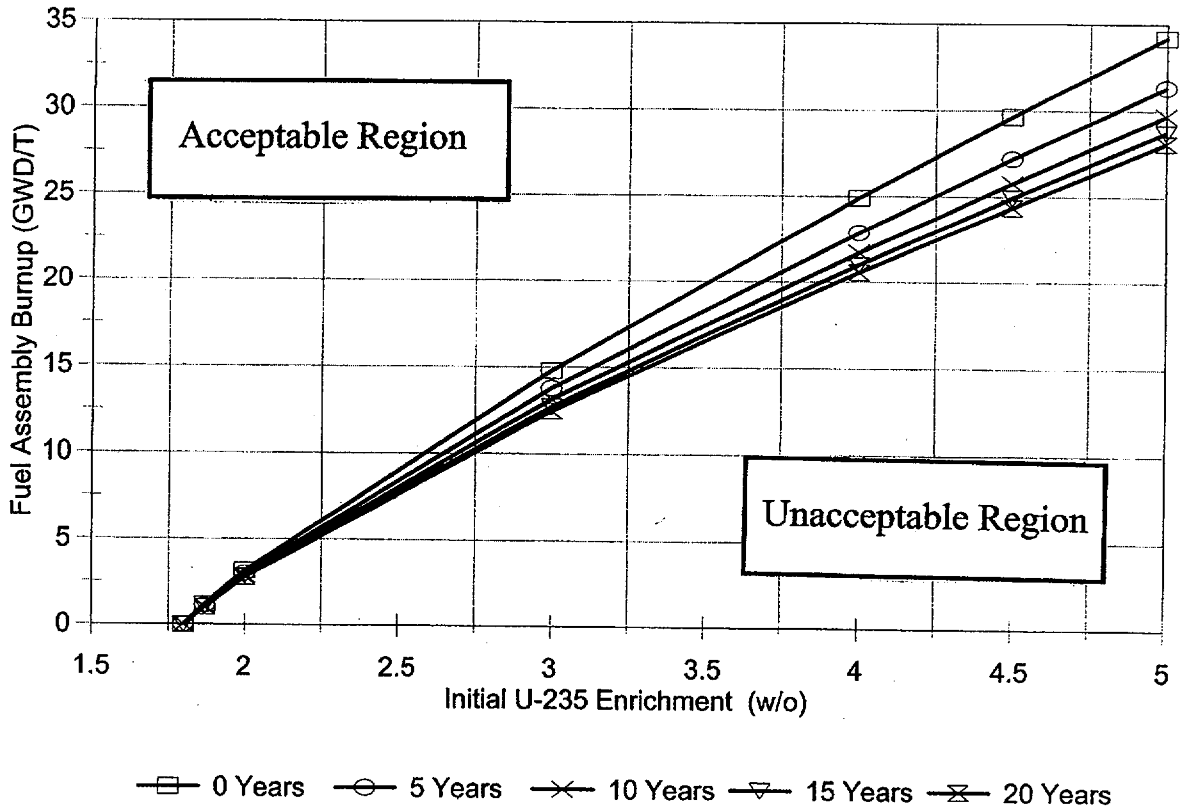


Figure II-8

REGION II

MINIMUM BURNUP FOR CATEGORY II-8 FUEL

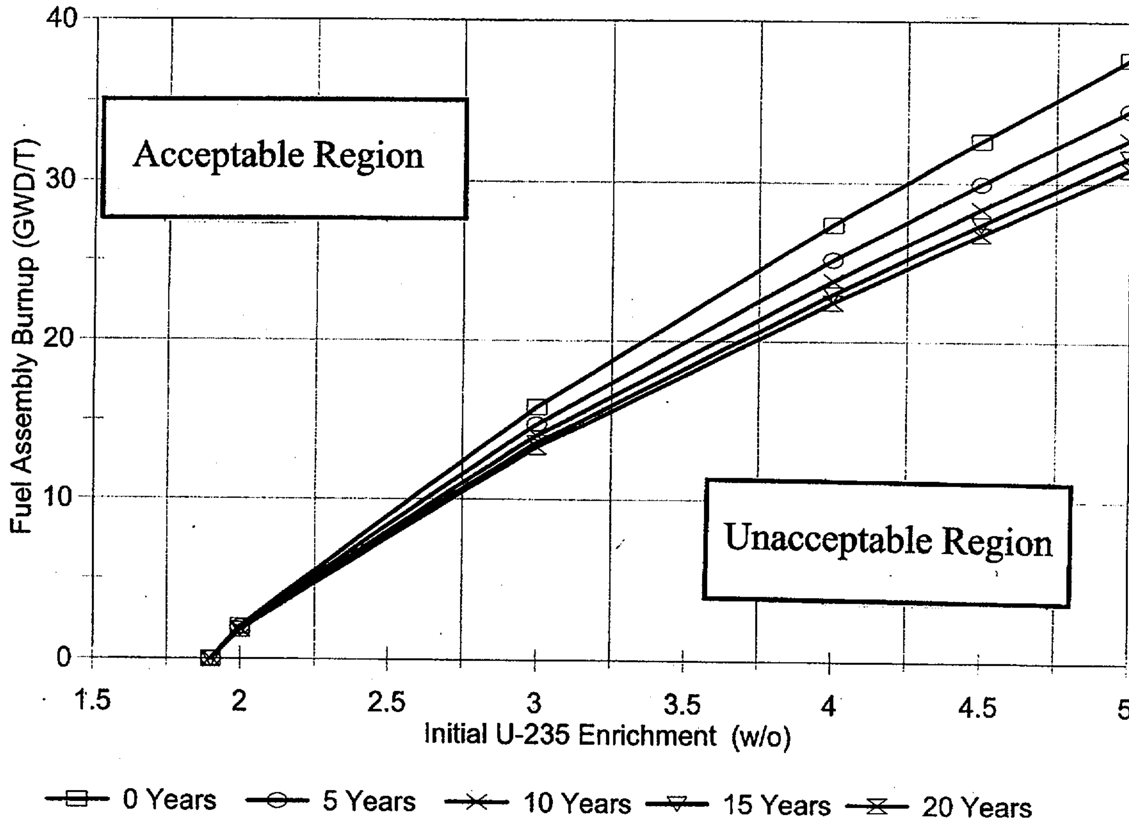


Figure II-9

REGION II

MINIMUM BURNUP FOR CATEGORY II-9 FUEL

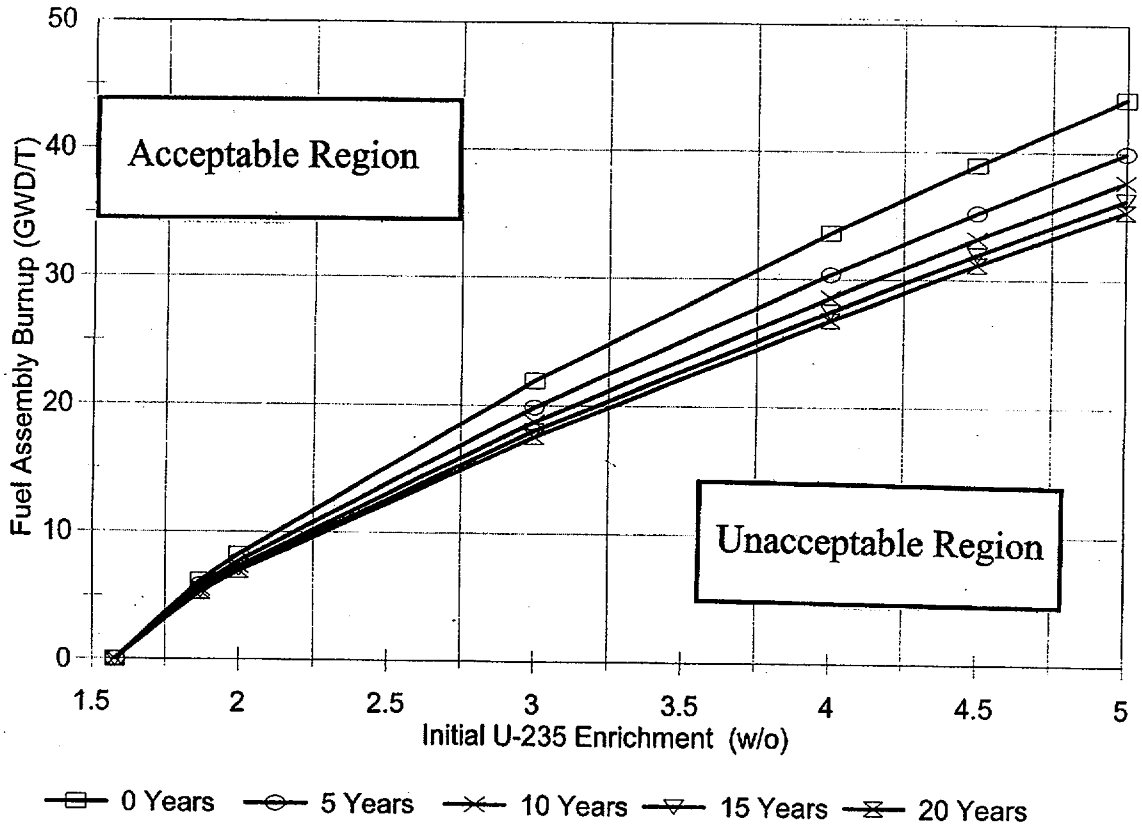


Figure II-10

REGION II

MINIMUM BURNUP FOR CATEGORY II-10 FUEL

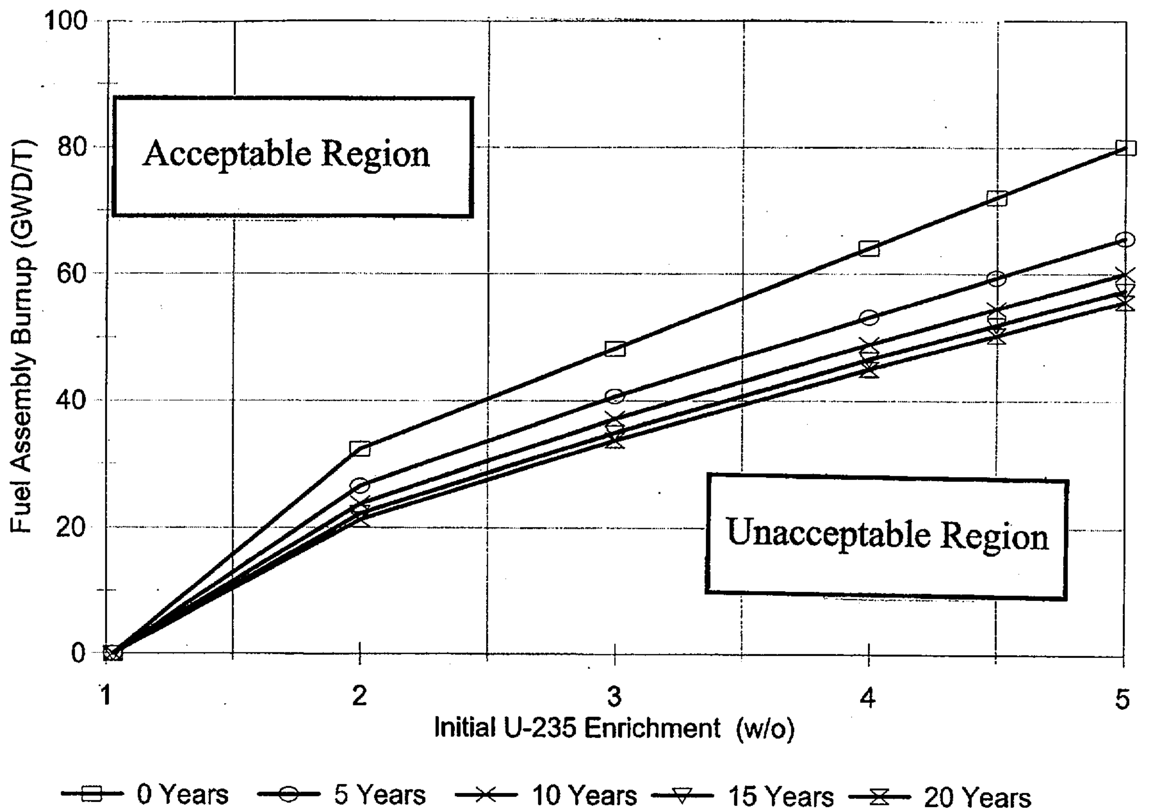


Figure II-11

REGION II

MINIMUM BURNUP FOR CATEGORY II-11 FUEL

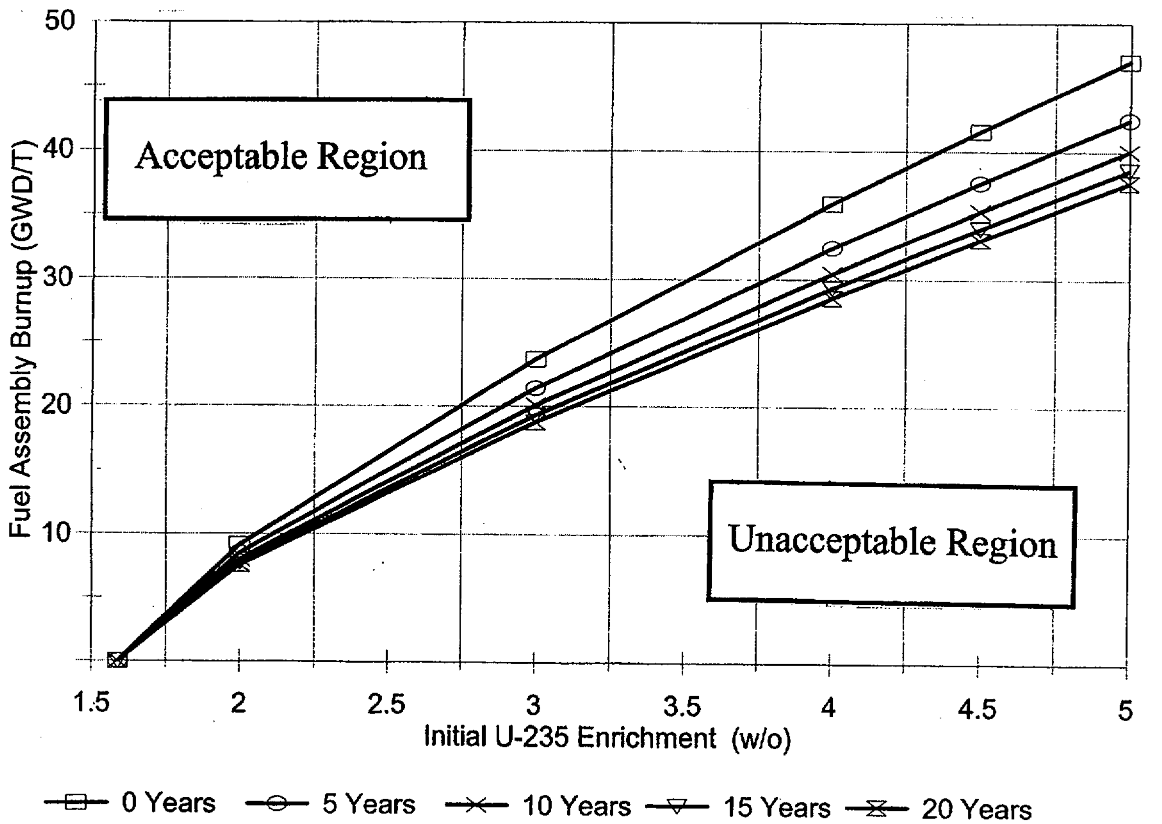


Figure II-12

REGION II

MINIMUM BURNUP FOR CATEGORY II-12 FUEL

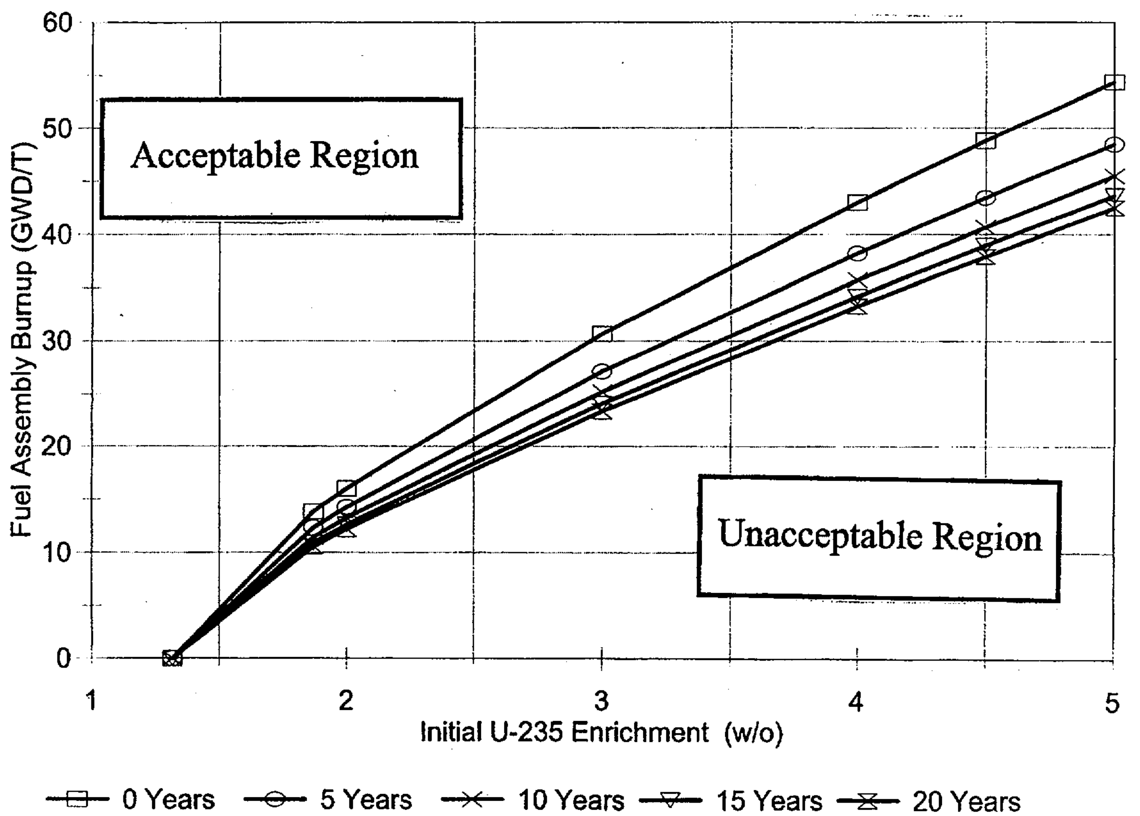


Figure II-13

REGION II

MINIMUM BURNUP FOR CATEGORY II-13 FUEL

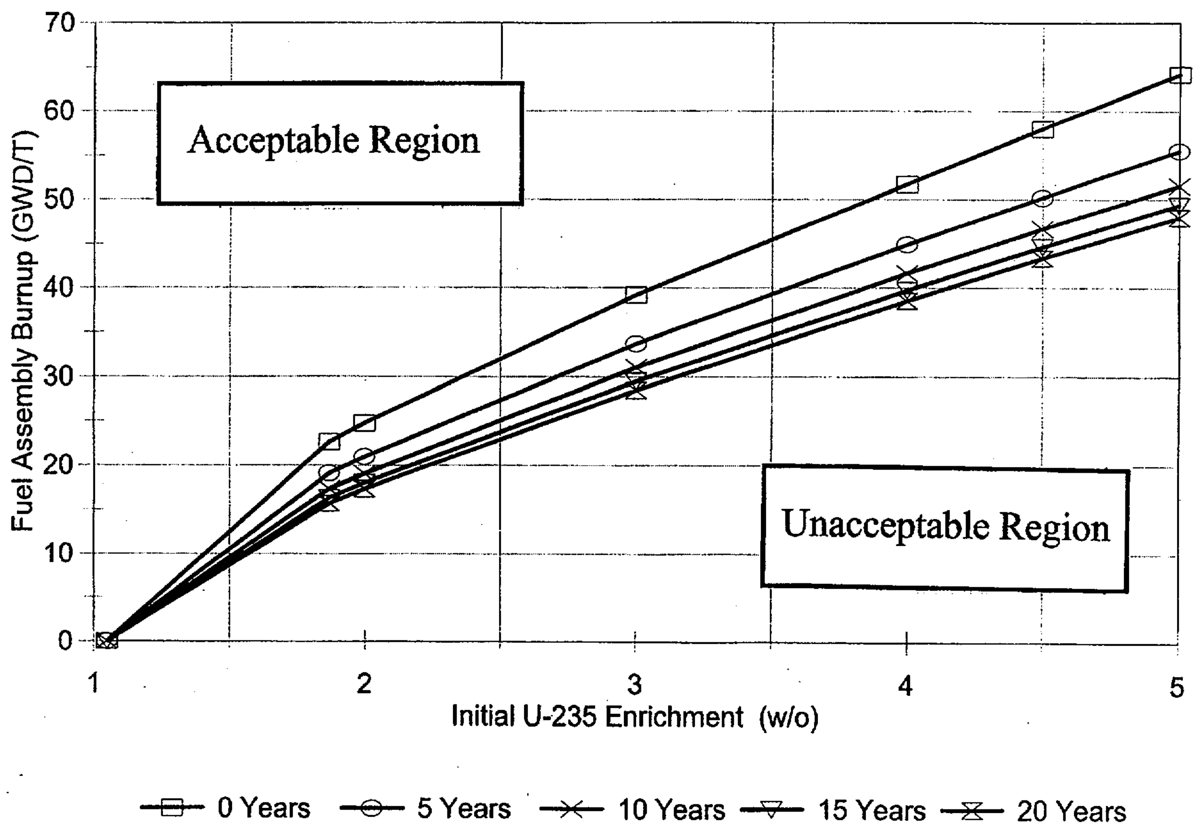


Figure II-14

REGION II

MINIMUM BURNUP FOR CATEGORY II-14 FUEL

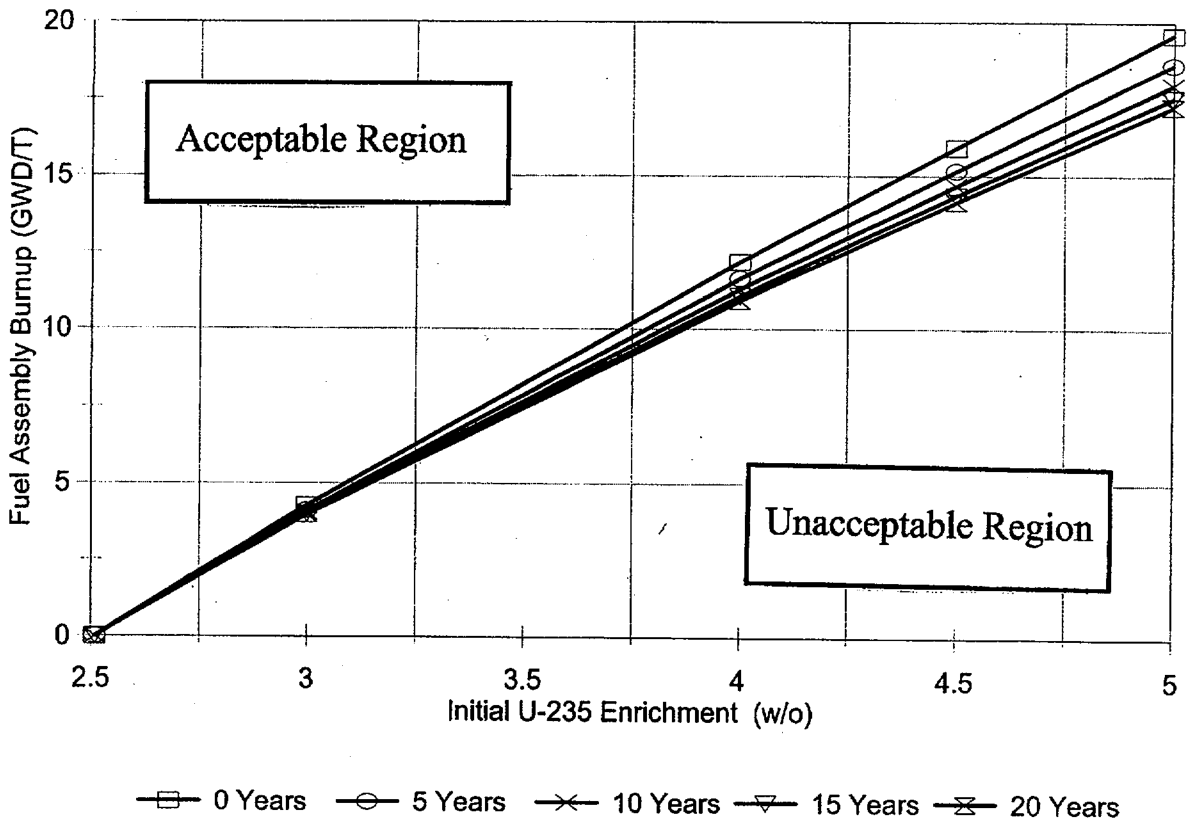


Figure II-15

REGION II

MINIMUM BURNUP FOR CATEGORY II-15 FUEL

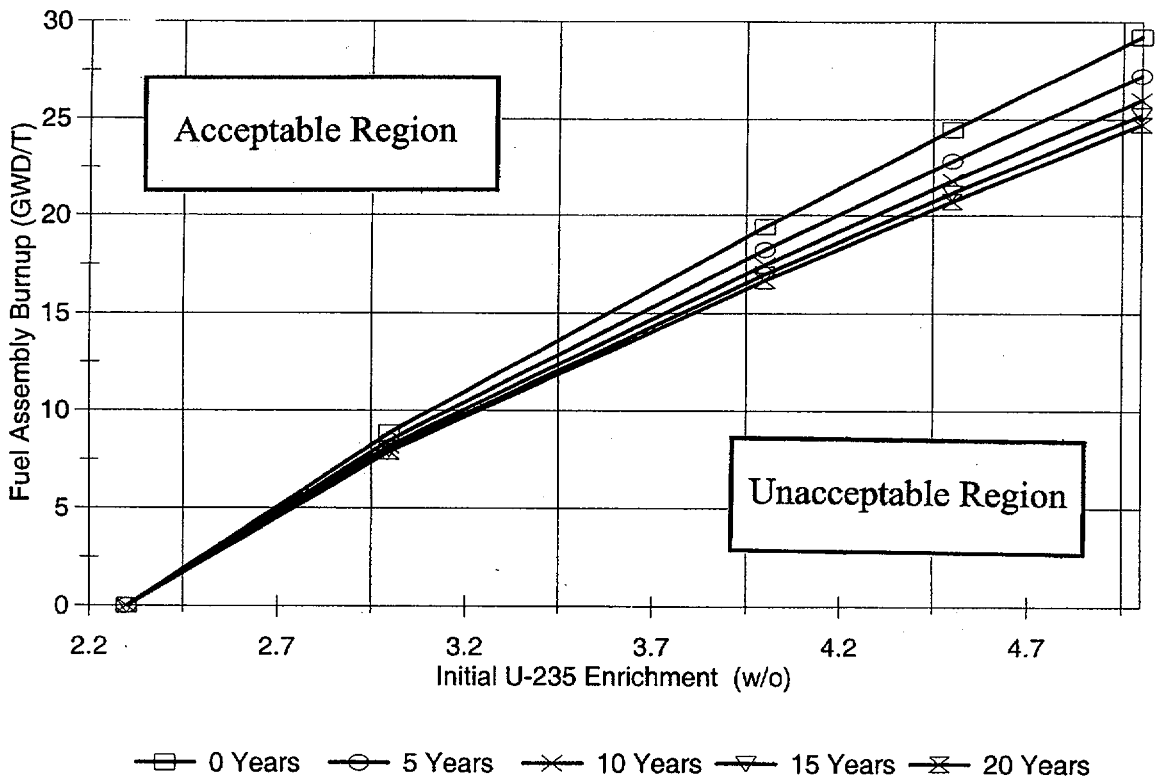


Figure II-16

REGION II

Boundary Between All Cell Storage And Checkerboard Storage

II-1	II-1	II-1	II-1	II-1	II-1
II-1	II-1	II-1	II-1	II-1	II-1
II-1	II-1	II-1	II-1	II-1	II-1
II-1	Empty	II-1	II-1	II-1	II-1
Empty	4.80	Empty	II-1	II-1	II-1
4.80	Empty	II-1	II-1	II-1	II-1

||
Interface

II-1	II-1	II-1	II-1	II-1	II-1
II-1	II-1	II-1	II-1	II-1	II-1
II-1	II-1	II-1	II-1	II-1	II-1
II-1	II-4	II-1	II-1	II-1	II-1
II-4	II-3	II-4	II-1	II-1	II-1
II-3	II-4	II-1	II-1	II-1	II-1

||
Interface

Note: (1) A row of empty cells can be used at the interface to separate the configurations
(2) It is acceptable to replace an assembly with an empty cell.

Figure II-17

REGION II

Boundary Between All Cell Storage And 3 Out Of 4 Storage

II-1	II-1	II-1	II-1	II-1	II-1
II-1	II-1	II-1	II-1	II-1	II-1
II-1	II-1	II-1	II-1	II-1	II-1
Blocked	1.80	Blocked	II-1	II-1	II-1
1.80	1.80	1.80	II-1	II-1	II-1
Blocked	1.80	Blocked	II-1	II-1	II-1

Interface

Note: (1) A row of empty cells can be used at the interface to separate the configurations

(2) It is acceptable to replace an assembly with an empty cell.

Figure II-18

REGION II

Boundary Between Checkerboard Storage And 3 Out Of 4 Storage

II-7	Blocked	II-7	Blocked	II-7	Blocked
II-7	II-7	II-7	II-7	II-7	II-7
II-7	Blocked	II-7	Blocked	II-7	Blocked
Blocked	4.80	Blocked	II-7	II-7	II-7
4.80	Blocked	4.80	Blocked	II-7	Blocked
Blocked	4.80	Blocked	II-7	II-7	II-7

||
Interface

Note: (1) A row of empty cells can be used at the interface to separate the configurations

(2) It is acceptable to replace an assembly with an empty cell.

Figure II-19

REGION II

Boundary Requirement For ALL 1 Out Of 9 Storage Patterns

II-1	II-1	II-1	II-1	II-1	II-1
II-1	II-1	II-1	II-1	II-1	II-1
II-1	II-1	II-1	II-1	II-1	II-1
Filler	Filler	Filler	II-1	II-1	II-1
Filler	A	Filler	II-1	II-1	II-1
Filler	Filler	Filler	II-1	II-1	II-1

Interface

Where:
(1) If A = 4.80 w/o + 0 Inserts, Filler = Category II-10
(2) If A = 4.80 w/o + 5 Inserts, Filler = Category II-11
(3) If A = 4.80 w/o + 5 Inserts, Filler = Category II-12
(4) If A = 4.80 w/o + 5 Inserts, Filler = Category II-13
(5) If A = Category II-14, Filler = Category II-13
(6) If A = Category II-14, Filler = Category II-11

Figure II-20
Orientation Of 3 Guide Tube Inserts

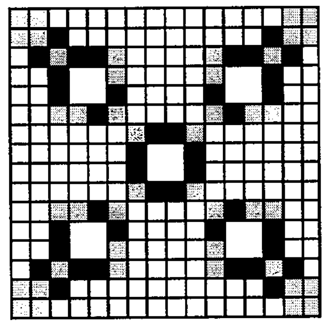
```
 ----------------------------------------
|                                     xxx |  <--- Serial
|                                       x |       Number
|                                       x |
|       XX                       OO       |
|       XX                       OO       |
|                                         |
|                                         |
|                  XX                     |
|                  XX                     |
|                                         |
|                                         |
|       OO                      XX        |
|       OO                      XX        |
|                                         |
|                                         |
 ----------------------------------------
```

XX = Guide Tube With Insert
XX

OO = Empty Guide Tube
OO

Figure II-21

SONGS UNITS 2 AND 3 FUEL ASSEMBLY WITH 40 ERBIA RODS



40 Erbia
Rods

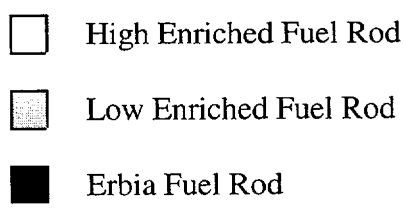
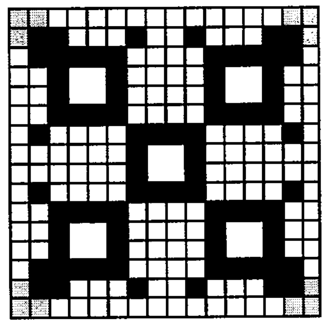
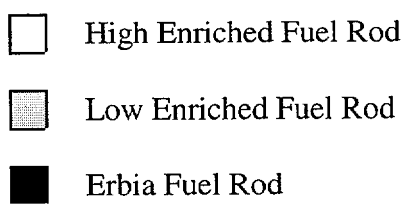


Figure II-22

SONGS UNITS 2 AND 3 FUEL ASSEMBLY WITH 80 ERBIA RODS



80 Erbia
Rods



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3. (A) Nuclear Regulatory Commission, Letter to All Power Reactor Licensees, B. K. Grimes, April 14, 1978, "OT Position for Review and Acceptance of Spent Fuel Storage and Handling Applications," as amended by the NRC letter dated January 18, 1979

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