ENCLOSURE 1 (PROPRIETARY) CONTAINS PROPRIETARY INFORMATION SUBMITTED UNDER 2.390
WITHHOLD FROM PUBLIC DISCLOSURE

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TXX-13001

Ref: 10 CFR 50.90
10 CFR 2.390

January 15, 2013

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: COMANCHE PEAK NUCLEAR POWER PLANT (CPNPP)
DOCKET NOS. 50-445 AND 50-446,
LICENSE AMENDMENT REQUEST (LAR) 12-06, REVISION TO TECHNICAL SPECIFICATIONS 3.7.16, "FUEL STORAGE POOL BORON CONCENTRATION," 3.7.17, "SPENT FUEL ASSEMBLY STORAGE" AND 5.5 "PROGRAMS AND MANUALS"

REFERENCES:
1. Letter logged TXX-12148, dated October 9, 2012 regarding Spent Fuel Pool Criticality Analysis from Rafael Flores (Luminant Power) to the NRC [ADAMS ML12292A193]
2. Letter logged TXX-12154, dated October 16, 2012 regarding Spent Fuel Pool Criticality Analysis from Rafael Flores (Luminant Power) to the NRC [ADAMS ML12298A360]
3. Letter dated October 22, 2012 regarding Confirmatory Action Letter (4-12-004) - Comanche Peak Nuclear Power Plant, Units 1 and 2, Commitments Regarding Spent Fuel Pool Storage Practices from the NRC to Rafael Flores (Luminant Power) [ADAMS ML12296A937]

Dear Sir or Madam:

Pursuant to 10CFR50.90, Luminant Generation Company LLC (Luminant Power) hereby requests an amendment to the Comanche Peak Nuclear Power Plant (CPNPP) Unit 1 Operating License (NPF-87) and CPNPP Unit 2 Operating License (NPF-89) by incorporating the attached change into the CPNPP Unit 1 and 2 Technical Specifications. This change request applies to both Units.

Per References 1 and 2, Luminant Power provided the NRC with specific commitments with regard to Technical Specifications for Spent Fuel Pool Storage. Reference 3 confirms the commitments Luminant Power will implement at Comanche Peak Nuclear Power Plant, Units 1 and 2, and will maintain in place until a license amendment for storing uprated fuel in the spent fuel pool is implemented. The proposed change is a request for a license amendment to TS 3.7.16 entitled "Fuel Storage Pool Boron Concentration," TS 3.7.17 entitled "Spent Fuel Assembly Storage", and TS 5.5 entitled "Programs and Manuals" prepared and submitted with the current spent fuel configurations considering fuel discharged from reactor operation at uprate conditions (3612 MWt). This submittal is in compliance with commitment number 3 identified in Reference 3. TS 3.7.16 describes the specified concentration of dissolved boron in the fuel storage pools. TS 3.7.17 describes storage configurations allowed in Region II high density storage racks based on burnup verses enrichment curves generated from a spent fuel pool (SFP) criticality analysis. In addition, a new program is proposed for TS 5.5 to include administrative controls to disperse low margin fuel assemblies in the Region II spent fuel storage racks. Luminant Power has entered this condition into the CPNPP corrective action program and, per Reference 2, restricted movement of additional discharged fuel into Region II until these proposed changes to the Technical Specifications can be implemented at CPNPP.

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Attachment 1 provides a detailed description of the proposed changes, a technical analysis of the proposed changes, Luminant Power's determination that the proposed changes do not involve a significant hazard consideration, a regulatory analysis of the proposed changes and an environmental evaluation. Attachment 2 provides the affected Technical Specification (TS) pages marked-up to reflect the proposed changes. Attachment 3 provides proposed changes to the Technical Specification Bases for information only. These changes will be processed per Comanche Peak Nuclear Power Plant (CPNPP) site procedures. Attachment 4 provides retyped Technical Specification pages which incorporate the requested changes. Attachment 5 provides retyped Technical Specification Bases pages for information only which incorporate the proposed changes.

Enclosure 1, "Comanche Peak Nuclear Power Plant Units 1 & 2 Interim Uprate Criticality Safety Analysis" (Proprietary) was provided by Westinghouse to support these changes. A non-Proprietary version of Enclosure 1 is provided in Enclosure 2. The Westinghouse Application for Withholding Proprietary Information from Public Disclosure CAW-12-3577, accompanying Affidavit, Proprietary Information Notice, and Copyright Notice are provided in Enclosure 3.

As Enclosure 1 contains information proprietary to Westinghouse Electric Company LLC, it is supported by an affidavit signed by Westinghouse, the owner of the information. The affidavit sets forth the basis on which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of Section 2.390 of the Commission's regulations.

Accordingly, it is respectfully requested that the information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10 CFR Section 2.390 of the Commission's regulations.

Correspondence with respect to the copyright or proprietary aspects of the items listed above or the supporting Westinghouse affidavit should reference CAW-12-3577 (included in Enclosure 3) and should be addressed to James A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company, Suite 428, 1000 Westinghouse Drive, Cranberry Township, Pennsylvania 16066.

Luminant Power requests approval of the proposed License Amendment by March 31, 2013, to be implemented within 90 days of the issuance of the license amendment. This amendment is required to restore the CPNPP license bases and would support MODE 6 operations in the spring refueling outage.

This Amendment provides an interim solution to spent fuel pool storage at CPNPP as it proposes changes to TS 3.7.17 LCO which prohibit storage of fuel discharged from future operating cycles in Region II. As previously identified in Reference 1, Luminant Power plans to submit to the NRC, a completely revised spent fuel pool criticality analysis by the end of March, 2013.

In accordance with 10CFR50.91(b), Luminant Power is providing the State of Texas with a copy of this proposed amendment.

This communication contains the following new or revised commitments which will be completed or incorporated into the CPNPP licensing basis as noted:

Number	Commitment	Due Date/Event
4494911	Luminant Power will prepare and submit a license amendment to revise Technical Specification 3.7.17, "Spent Fuel Assembly Storage" with the current spent fuel pool configurations with fuel discharged from reactor operation at uprate conditions (3612 MWt).	Complete

The Commitment number is used by Luminant Power for the internal tracking of CPNPP commitments.

Should you have any questions, please contact Mr. J. D. Seawright at (254) 897-0140.

I state under penalty of perjury that the foregoing is true and correct.

Executed on January 15, 2013.

Sincerely,

Luminant Generation Company, LLC

Rafael Flores

By: [signature]
Fred W. Madden
Director, Oversight and Regulatory Affairs

Attachments
1. Description and Assessment
2. Proposed Technical Specifications Changes (Mark-up)
3. Proposed Technical Specifications Bases Changes (Markup For Information Only)
4. Retyped Technical Specification Pages
5. Retyped Technical Specification Bases Pages (for information only)

Enclosures
1. Comanche Peak Nuclear Power Plant Units 1 & 2 Interim Uprate Criticality Safety Analysis (Proprietary)
2. Comanche Peak Nuclear Power Plant Units 1 & 2 Interim Uprate Criticality Safety Analysis (Non-Proprietary)
3. Westinghouse Application for Withholding Proprietary Information from Public Disclosure CAW-12-3577, accompanying Affidavit, Proprietary Information Notice, and Copyright Notice

c -
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ATTACHMENT 1 to TXX-13001

DESCRIPTION AND ASSESSMENT

LICENSEE'S EVALUATION

1.0 DESCRIPTION

By this letter, Luminant Generation Company LLC (Luminant Power) requests an amendment to the Comanche Peak Nuclear Power Plant (CPNPP) Unit 1 Operating License (NPF-87) and CPNPP Unit 2 Operating License (NPF-89) by incorporating the attached change into the CPNPP Unit 1 and 2 Technical Specifications. Proposed change LAR 12-06 is a request to revise Technical Specifications (TS) 3.7.16, "Fuel Storage Pool Boron Concentration," TS 3.7.17, "Spent Fuel Assembly Storage" and TS 5.5 "Programs and Manuals" for Comanche Peak Nuclear Power Plant (CPNPP) Units 1 and 2. The purpose of this change is to account for storage of fuel subject to uprated power operations.

2.0 PROPOSED CHANGE

The proposed change would revise two Technical Specifications and add a new program requirement to the Technical Specifications. Changes to the Technical Specifications are described below and evaluated in Section 4.0 of this attachment.

TS 3.7.16, "Fuel Storage Pool Boron Concentration"

Revise LCO 3.7.16 from 2000 ppm boron concentration to 2400 ppm boron concentration.

TS 3.7.17, "Spent Fuel Assembly Storage"

Revise LCO 3.7.17, SR 3.7.17.1, Figure 3.7.17-1 to remove unused reference to decay time and included power history reference. Revise Figure 3.7.17-2 to remove unused reference to decay time and included power history reference and include curve for fuel exposed above 3458 MWt. Revise Figure 3.7.17-3 to include power history.

TS 5.5, "Programs and Manuals"

Add new program (Spent Fuel Assembly Dispersion Program) to TS 5.5, to include administrative controls to disperse the low margin fuel assemblies in the Region II spent fuel storage racks.

The changes to TS 3.7.17 include the following addition to the LCO: "Storage of fuel assemblies in Region II of the spent fuel pool shall be limited to fuel assemblies discharged from Unit 1 Cycle 16, Unit 2 Cycle 14 and prior operating cycles." Luminant Power has committed to prepare and submit a separate License Amendment Request for TS 3.7.17 (Reference 7.6), based on a more modern criticality analysis which follows the most recent NRC guidance documents. The fuel cycle limitations in the LCO reinforce these commitments and ensure the proposed changes are utilized to address the required actions of Confirmatory Action Letter 4-12-004, rather than a long term fuel storage solution.

Mark-ups of the proposed Technical Specification changes are provided in Attachment 2. A copy of the proposed mark-up of the Technical Specification Bases is provided in Attachment 3 for information only. Revised (clean) Technical Specification and Technical Specification Bases pages are provided in Attachment 4 and 5, respectively.

3.0 BACKGROUND

Comanche Peak Nuclear Power Plant (CPNPP has two pools, Spent Fuel Pool 1 (SFP1) and Spent Fuel Pool 2 (SFP2), containing spent fuel racks for storage of spent nuclear fuel. The spent fuel racks are designed to accommodate a safe shutdown earthquake, shipping, and handling loads, and the dead load of the spent fuel assemblies.

The spent fuel assemblies in SFP1 and SFP2 are stored in high density Region I and Region II racks. The total usable capacity for SFP1 is 1,684 cells, and is 1,689 for SFP2. This provides a total storage space for the two pools of 3,373 fuel assemblies.

The Region I and Region II racks are composed of vertical cells fastened together in a checkerboard arrangement to produce a matrix structure. The cells are welded to a baseplate and to one another to form an integral structure without the use of a supporting grid structure. The center to center spacing between cells within a Region I rack is a nominal 10.6 inch by a nominal 11.0 inch. The Region I racks use a flux trap design and have neutron absorbing "Boral" panels between adjacent storage cells to provide neutron attenuation. The center to center spacing between cells within a Region II rack is a nominal 9.0 inches. The Region II racks do not use a flux trap design and have no special neutron absorbing material.

SFP1 and SFP2 each contain two (2) 10 x 8 Region I rack modules, one (1) 9 x 8 Region I rack module, six (6) 12 x 14 Region II rack modules, and three (3) 11 x 14 Region II rack modules (twelve racks total). Some of the Region II cells in SFP1 have been modified to allow for fuel inspection.

Operation of the spent fuel pool includes periodic chemical analyses and operational surveillance for determining concentrations of chloride, fluoride and boron. The current chemical limits used in monitoring the spent fuel pools are, as follows:

Chlorides	0.15 ppm (maximum)
Fluorides	0.15 ppm (maximum)
Boron Concentration	2400 ppm (minimum) (Note the current TS 3.7.16 minimum is 2000 ppm)

Additional descriptions may be found in Section 9.1 of the FSAR.

This request for a License Amendment (LAR) is to revise Technical Specification (TS) 3.7.16, "Fuel Storage Pool Boron Concentration," TS 3.7.17, "Spent Fuel Assembly Storage," and TS 5.5, "Programs and Manuals." TS 3.7.17 describes storage configurations allowed in Region II high density storage racks based on burnup verses enrichment curves generated from a spent fuel pool (SFP) criticality analysis. The current TS 3.7.17 is not bounding for fuel discharged from the current licensed power level. Luminant Power has prepared this LAR to address this specific condition until an analysis which follows the recommendations of the most recent NRC guidance can be submitted to the NRC. This is reinforced by the inclusion of limitations, captured in the TS 3.7.17 LCO, which do not allow storage of fuel discharged from future operating cycles in Region II.

The NRC issued the Safety Evaluation approving the last amendment to TS 3.7.17 (Amendment 87) in October of 2001 (Reference 7.3). Amendment 87 updated the Technical Specifications to address Boron Credit for "3 out of 4" and "4 out of 4" storage configurations in the Region II area of the spent fuel storage racks. During the NRC review of the License Amendment Request supporting Amendment 87, concerns arose regarding non-conservatisms associated with axial burnup in the methodology used by Luminant Power (Westinghouse Topical Report WCAP-14416). On July 27, 2001 the NRC issued a letter to Westinghouse to identify the non-conservatisms related to the Axial Burnup Bias in WCAP-14416. The NRC withdrew approval of this topical report due to these non-conservatisms in the WCAP-14416 methodology (Reference 7.5).

The impact of these non-conservatisms were specifically addressed in 2001 in the CPNPP Analysis of Record supporting Amendment 87; in fact, the withdrawal letter is referenced in the NRC approved Safety Evaluation Report (Reference 7.3). The CPNPP Analysis of record includes a penalty calculated under conservative operating conditions to address the axial bias issue, which was reviewed and approved by the NRC. The NRC review of the non-conservatisms identified in the July 27, 2001 letter (Reference 7.5) was discussed in the Safety Evaluation for Amendment 87 of the CPNPP Technical Specifications. From the SER associated with LAR 87 (Reference 7.3):

> "The NRC staff concludes that these calculations [associated with the axial bias penalty] are acceptable; however, the NRC staff has notified Westinghouse in a letter dated July 27, 2001, that, since the axial bias methodology as it is currently described in Reference 20, is known to be non-conservative, this section of [WCAP-14416] is no longer valid."

Furthermore, subsequent to the NRC letter in July 2001, the NRC conclusions in the safety evaluation for the current CPNPP analysis of record for the "3 out of 4" and "4 out of 4" storage configurations determined that certain portions of WCAP-14416 remained approved and that Luminant Power supported those approved portions of the WCAP-14416 with plant specific analysis. The NRC safety evaluation stated:

> "The TS changes proposed as a result of the revised criticality analysis are consistent with the NRC-approved methodology given in Reference 20, with the exception of the axial bias treatment. The issues associated with the axial bias section of Reference 20 have been resolved on a plant specific bases. Based on the agreement with the approved portions of the methodology and additional supporting plant specific analysis, the NRC staff finds these TS changes acceptable."

The NRC issued Information Notice 2011-03 in February 2011 which describes potential non-conservatisms in criticality analysis. This issue is discussed in more detail in Section 4.0, which concludes that the analysis remains conservative, since the non-conservatisms are offset by excess conservatism in the Axial Burnup Bias Penalty.

Therefore, this approved methodology was determined to be appropriate to support this LAR to address this specific condition until a "state of the art" analysis can be submitted to the NRC.

4.0 TECHNICAL ANALYSIS

The changes to Technical Specification sections 3.7.16, 3.17.17, and 5.5.22 affect storage of fuel in the Region II storage racks of both SFP1 and SFP2, but have no impact on the storage in Region I or any other allowed storage location at CPNPP. Additionally, the changes do not affect the Thermal-Hydraulic, Mechanical, or Accident Analysis for the Spent Fuel Pool storage racks. Note that License Amendment 146 for the Stretch Power Uprate (Reference 7.8) addressed the potential impacts of the uprate on the Spent Fuel Pool Cooling and Cleanup System, Spent Fuel Pool Area Ventilation System, and New Fuel Storage system. The Safety Evaluation Report concludes that the Power Uprate was acceptable with respect to these systems, but stated that Spent Fuel Pool criticality analysis would be addressed separately.

The Rated Thermal Power limit for both Unit 1 and Unit 2 has been increased to 3612 MWt. This value is higher than the assumed power level utilized in the 2001 criticality analysis (3565 MWt) which supported License Amendment Request 87, which established the current TS 3.7.17 limits. This analysis (Reference 7.1), which will be referred to as the 2001 analysis, was reviewed and approved by the NRC (Reference 7.3).

Note that Amendment 87 added the "3 out of 4" and "4 out of 4" configurations to TS 3.7.17, and prior to this, fuel in Region II was limited to a "2 out of 4" checkerboard pattern. The analysis which supports the "2 out of 4" and "1 out of 4" configurations does not credit soluble boron, and was approved by the NRC in 1996 (Reference 7.4). This 1996 analysis is not affected or altered by this submittal. The proposed revision to the TS 3.7.17 limits specifically restricts Uprate Fuel Assemblies from being stored in a "2 out of 4" configuration, unless they satisfy the burnup/enrichment limits for "3 out of 4" storage. Since the burnup requirements for "3 out of 4" storage are higher, this restriction is conservative. This allowance for "2 out of 4" storage is included to permit fuel movement out of a "3 out of 4" configuration, which may result in the creation of a checkerboard "2 out of 4" pattern.

Note that storage in a "1 out of 4" configuration does not credit burnup, and is therefore unaffected by the Uprate.

The Amendment 87 Safety Evaluation Report describes that the 2001 analysis demonstrates k_{eff} is less than 1 when flooded with unborated pool water at a 95/95 probability/confidence level, and that k_{eff} is less than or equal to 0.95 when flooded with borated water, including all uncertainties at 95/95 level. Note that non-conservatisms in this analysis associated with Information Notice 2011-03 are addressed below.

The increased reactor power associated with the power uprate results in a hardened neutron flux spectrum, which results in more plutonium production in an assembly relative to one with equivalent burnup operated under pre-uprate conditions. Additional analysis has been completed to account for this reactivity affect, using the same methodology utilized in the 2001 analysis. This analysis provides the basis for the changes to TS 3.7.17 which account for the power uprate.

In addition to revising TS 3.7.17 to address the impact of the power uprate, TS 3.7.16 is revised to ensure a high level of excess subcritical margin is maintained by increasing the Technical Specification requirement for soluble boron in the Spent Fuel Pools from 2000 ppm to 2400 ppm. The addition of TS 5.5.22 Spent Fuel Assembly Dispersion Program in TS 5.5 ensures that a configuration is maintained in Region II which prevents the storage of multiple low excess margin assemblies in close proximity (as discussed in more detail below). This excess margin program provides additional assurance that regulatory requirements are met, and accounts for reactivity affects which are NOT credited in the criticality analysis.

Limited Cycles

The changes to TS 3.7.17 include the following addition to the LCO: "Storage of fuel assemblies in Region II of the spent fuel pool shall be limited to fuel assemblies discharged from Unit 1 Cycle 16, Unit 2 Cycle 14 and prior operating cycles." Note that these cycles represent the current operating cycles as of January 2013.

These limitations are acceptable, since Luminant Power has committed to prepare and submit a separate License Amendment Request for TS 3.7.17, based on a more modern criticality analysis which follows the most recent NRC guidance documents. The fuel cycle limitations in the LCO reinforce these commitments.

As discussed below, to address non-conservatism identified in IN-2011-03, Luminant Power has quantified conservatisms in the 2001 analysis which are dependent upon conservative operating history assumptions. As of January 2013, the operating history of CPNPP fuel cycles has not approached these conservative operating assumptions. By limiting Region II storage to apply only to fuel discharged from completed cycles or current operating cycles, the fuel operating history is well understood, and therefore the conservatism of the operating history assumptions is ensured.

Methodology

Determination of "3 out of 4" Burnup versus Enrichment Limits for Uprate Conditions

The reactivity changes due to the Power Uprate on the Region II Criticality Analysis were analyzed using identical methodology, codes, and code versions used in the 2001 analysis, with appropriate and conservative differences in input values and assumptions discussed below.

For the majority of attributes, the methodology of WCAP-14416-NP-A Rev 1 was utilized as the basis for the 2001 analysis, as modified to account for non-conservatisms in the Axial Burnup Bias Penalty. The impact of these non-conservatisms were specifically addressed in 2001 in the CPNPP Analysis of Record supporting Amendment 87, as described in Section 3.0.

Using this methodology, a revised burnup versus enrichment curve was developed for the "3 out of 4" storage configuration, which supports the proposed revision to Figure TS 3.7.17-2. Revised burnup limits for the "4 out of 4" and "2 out of 4" cases are not included in this submittal. Therefore TS Figures 3.7.17-1 (4 out of 4 storage) is being revised to prohibit storage of fuel operated at uprate conditions and allow storage of fuel only if it operated at a power equal or less than 3458 MWt, and TS Figures 3.7.17-3 (2 out of 4 storage) is being revised to only allow storage of uprate fuel when the limits of 3.7.17-2 (3 out of 4 storage) are satisfied.

The revised burnup versus enrichment limit includes additional changes. The changes from the 2001 analysis are summarized below:

- The core Thermal Power level was increased from 3565 MWt to 3612 MWt.
- The assumption for fuel theoretical density was increased as described in Enclosure 1, "Comanche Peak Nuclear Power Plant Units 1 & 2 Interim Uprate Criticality Safety Analysis." Note that fuel density tolerance was not changed.
- The Axial Burnup Bias Penalty in the 2001 analysis was calculated using conservative operating assumptions, and the calculation of the penalty is dependent upon the highest value of the burnup limit. Since this analysis will increase the burnup limits for storage, the Axial Burnup Bias Penalty was appropriately increased to reflect this. The conservative operating assumptions utilized in the 2001 analysis were not changed.
- Several reactivity credits were taken in the 2001 analysis to offset the impact of the Axial Burnup Bias Penalty. The "Boron letdown curve for HFP depletion credit" value was dependent upon burnup, similar to the Axial Burnup Bias Penalty, and was therefore updated. No other credits were changed, but the "grid and sleeve credit" and "pool leakage credit" were omitted for additional conservatism.
- 500 pcm of administrative margin was included in the analysis.

Using the methodology updated for uprate conditions, including the specific code and code versions used to support Reference 7.3, a revised burnup versus enrichment curve for the "3 out of 4" storage configuration was determined.

The total soluble boron required without accidents, and the total soluble boron required with accidents, from the 2001 analysis was confirmed to still be applicable to the uprate analysis. Application of the burnup penalty reduces the reactivity of assemblies depleted at uprated conditions to below the reactivity assumed when determining the soluble boron requirements for the 2001 analysis, and analysis was performed to confirm that no changes to the soluble boron requirements need to be made due to the uprate.

In addition to the changes described above, a legacy change was made to Technical Specification 3.7.17 to remove reference to "decay time". Decay time was not utilized as a factor in determining acceptable storage configurations, and has therefore been removed.

Treatment of Depletion Uncertainty and Statistical Treatment of Methodology Bias Uncertainty

Rather than considering the depletion uncertainty in the statistical treatment of uncertainties, the 2001 CPNPP analysis accounted for this uncertainty in the "Burnup Credit Reactivity Equivalencing" calculations, which is discussed in section 3.6.2 of the Safety Evaluation Report. Effectively, this method determines the potential reactivity impact of the depletion uncertainty and calculates an increase in SFP boron concentration which compensates for this affect. Note that this treatment is inherently conservative when soluble boron is considered (since the value is simply added to the required boron, rather than being added to the uncertainties using a "root mean square" method), but is not accounted for the non-borated case.

The NRC identified this non-conservatism in the non-borated case and communicated the issue to the industry in February 2011 per Information Notice 2011-03, "Nonconservative Criticality Safety Analysis for Fuel Storage".

The Information Notice describes that the depletion uncertainty should be "developed and combined with other calculation uncertainties", and also states "10 CFR 50.68 requires licensees to demonstrate that k-effective is less than 1.0 with a 95/95 confidence for the unborated cases. When these demonstrations rely upon fuel depletion, the depletion uncertainty must be included in both the borated and unborated analyses."

To ensure the calculated k_{eff} would remain < 1.0 including uncertainties in the unborated case, Luminant Power quantified the impact of the depletion uncertainty in the unborated case. This evaluation verified that the 2001 analysis remains conservative when considering other margin available within the Analysis.

The results of the quantification of the depletion uncertainty impact demonstrated that for the "3 out of 4" configuration, at an enrichment of 5 wt%, the impact would be less than 0.01500 Δk. When that depletion uncertainty is added to the rackup of biases and uncertainties, the impact is a maximum of 0.00701 Δk. Note that the impact is less than the calculated uncertainty (0.01500 Δk) because the depletion uncertainty is root-sum-squared with the other uncertainties (Reference 7.1). The impact was evaluated for the full range of enrichments and applicable configurations, and the impact of the "3 out of 4", 5 wt% depletion uncertainty is bounding.

To address this, calculations were performed to quantify the excess margin available in the Axial Burnup Bias Penalty utilized in the 2001 analysis (0.02091 Δk for "3 out of 4" storage). In the 2001 analysis, the Axial Burnup Bias Penalty was calculated using conservative assumptions, which are discussed in more detail in the Westinghouse Enclosure. Calculations of a revised penalty have been performed for both pre-uprate and uprate conditions and these calculations demonstrate that the Axial Burnup Bias Penalty would be between 0.00500 and 0.00800 Δk at 5% enrichment.

Since this value is much lower than the conservative Axial Burnup Bias Penalty value utilized in the 2001 analysis (0.02091 Δk), the calculations demonstrate that at least 0.01200 Δk of additional margin is available. This excess margin is bounding for lower enrichment values. This excess conservatism bounds the non-conservative impact of including the depletion uncertainty in the unborated case (0.00701 Δk).

IN-2011-03 also discusses the statistical treatment of uncertainties used in criticality safety analysis; specifically the potential to inappropriately calculate the standard deviation associated with the validation of the Monte Carlo software. The 2001 analysis did not treat the uncertainties as described in the Information Notice. This only affects the "Methodology Bias Uncertainty".

Based on analysis performed by Westinghouse, it is expected that using the recommended method for the statistical treatment of the Methodology Bias Uncertainty from IN-2011-03 would result in a lower total uncertainty value. However, the conservative impact of increasing this uncertainty by 100% was calculated.

- The value utilized in the Analysis of Record is 0.00300 Δk
- If this value was increased by 100%, up to 0.00600 Δk, the "Total Uncertainty" would increase from 0.01254 to 0.01358 (calculated as the square-root of the sum of the squares of all uncertainties). This represents an increase in reactivity of 0.00104 Δk.
- This increase in calculated 95/95 k_{eff} reactivity remains bounded by the excess conservatism in the Axial Burnup Bias Penalty discussed above.

Luminant Power has addressed the Information Notice by quantifying the impact of the issues on the 2001 analysis which support the TS 3.7.17 limitations. Excess conservatism in the Axial Burnup Bias Penalty (due to the overly conservative assumptions) in the 2001 analysis provides margin to offset both of the issues identified in IN-2011-03, and ensures the maximum calculated k_{eff} remains < 1.0 with uncertainties in the unborated case.

Additional Technical Specification Changes which Provide Additional Reactivity Margin

Limits for k_{eff}, including uncertainties, are satisfied via compliance with the revised TS 3.7.17 limitations. However, since the methodology used to generate these limits is based on analysis performed in 2001, the analysis does not follow the recommendations of the most recent NRC guidance for performing Criticality Analysis for Spent Fuel Pool storage.

Until a more modern criticality analysis which meets the latest NRC guidance can be prepared and reviewed, Luminant Power is incorporating two changes into the Technical Specifications which provide additional reactivity margin.

First, the Technical Specification limit for SFP Boron concentration is being increased from 2000 ppm to 2400 ppm. This is reflected in the change to the requirements of Technical Specification 3.7.16. Note that this change continues to bound the required boron concentration to mitigate accident conditions from the 2001 analysis. Additionally, there are no adverse affects to the Spent Fuel Pools due to increasing this minimum boron value, and it is common industry practice at Pressurized Water Reactors to maintain greater than 2400 ppm of soluble boron in the Spent Fuel Pools.

Second, the Spent Fuel Assembly Dispersion Program will be required by Technical Specification 5.5.22. This program is used to ensure that a less reactive configuration is maintained in the spent fuel pool Region II storage racks, when compared to the bounding configurations allowed by TS 3.7.17. This program prevents storing multiple "low margin" fuel assemblies (fuel with relatively low values of decay time and excess burnup as discussed below) in the same area within the Region II storage racks. This results in the dispersal of low margin fuel within fuel assemblies with higher levels of reactivity margin.

A value of excess reactivity margin provides a relative measure of margin beyond the assumptions utilized in the spent fuel pool criticality analysis. The excess margin is based on a quantification of (1) fuel depletion beyond the minimum burnup required by TS 3.7.17, and (2) the affects of natural radioactive decay of actinides and fission products within the fuel.

Calculations were performed to determine conservatively low estimates for these effects for fuel stored in Region II (Reference 7.7). The values are conservative for "2 out of 4", "3 out of 4", and "4 out of 4" storage configurations.

Based on the calculated values of Excess Margin, configurations with low reactivity margin are prevented. No two fuel assemblies with low Excess Margin (less than 1000 pcm each) are allowed to be stored adjacent to each other.

While determining the reactivity margin of an assembly, consideration is given to the area surrounding the assembly. An assembly surrounded by other assemblies that are closer to the burnup requirement would be more reactive than an assembly surrounded by assemblies that are farther from the burnup requirement. Therefore, when determining the excess margin of an assembly (or average margin for an area of the pool), the assembly in question is included as well as all adjacent (both face and corner) assemblies; essentially this means viewing each assembly as the center of a 3 x 3 configuration. For all assemblies stored in Region II, the average value of the reactivity margin of all adjacent fuel assemblies which are stored in a 3x3 array centered on the assembly must be greater than 2000 pcm.

This program provides additional margin to the regulatory limits of k_{eff} by ensuring the actual SFP storage configuration is less reactive than the analyzed configuration.

<u>Conclusion</u>

In conclusion, the changes to TS 3.7.17 allow safe storage of spent fuel operated at a power level of 3612 MWt in the Region II storage racks. The limitations for storage of fuel depleted at the uprate conditions ensure a lower reactivity is maintained when compared to the 2001 analysis, which supports the TS 3.7.17 limits associated with pre-uprate conditions (which were not changed in this submittal).

Items in the supporting analysis related to Information Notice 2011-03 have been addressed by ensuring the excess conservatism in the Axial Burnup Bias Penalty bounds the reactivity impact of (1) including depletion uncertainty in the unborated case and (2) changing the statistical treatment of the methodology bias uncertainty.

To provide additional reactivity margin, until a more modern criticality analysis which follows the most recent NRC recommendations can be created and submitted for review, Luminant Power will maintain excess reactivity margin in the Region II storage configurations, beyond the margin provided in the supporting analysis. This margin is provided by an increased soluble boron limit of TS 3.7.16, and the Spent Fuel Assembly Dispersion Program in TS 5.5.22.

5.0 REGULATORY ANALYSIS

5.1 No Significant Hazards Consideration

Luminant Power has evaluated whether or not a significant hazards consideration is involved with the proposed amendment(s) by focusing on the three standards set forth in 10CFR50.92, "Issuance of amendment," as discussed below:

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

   Response: No

   This proposed license amendment includes changes which provide the criteria for acceptable fuel storage in Region II racks. The proposed license amendment ensures that the k_{eff} of the spent fuel pools will remain within the current acceptance criteria under normal and accident conditions.

   Administrative controls are used to maintain the specified storage patterns and to assure storage of a fuel assembly in a proper location based on initial U-235 enrichment, burnup, and power history.

   There is no significant increase in the probability of an accident concerning the potential insertion of a fuel assembly in an incorrect location in the Region II racks. Existing administrative processes will be used to ensure Technical Specification spent fuel rack storage configuration limitations are satisfied.

   There is no increase in the probability of the loss of normal cooling to the fuel storage pool water due to the presence of increased soluble boron in the pool water for subcriticality control. The amount of soluble boron required to offset the reactivity increase associated with water temperature outside the normal range was established for the existing storage configurations. The concentration of soluble boron currently proposed (Technical Specification 3.7.16) has been maintained in the fuel storage pool water for many years, and adds additional conservatism above that required for subcriticality control.

   The consequences of all of these changes have been assessed and the current acceptance criteria on k_{eff} in the licensing basis of CPNPP will continue to be met. The analysis methods used are consistent with methods used by Luminant Power in the current approved Technical Specification, updated as appropriated to account for additional uncertainties identified since the 2001 analysis.

   Based on the acceptability of the methodology used and compliance with the acceptance criteria on k_{eff} in the current CPNPP licensing basis, the revised boron concentration requirement and the use of the Region II racks for fuel exposed to 3612 MWt do not involve a significant increase in the probability or consequences of an accident previously evaluated.

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

Response: No

The actual boron concentration in the fuel storage pool is currently maintained at 2,400 ppm for SFP1 and SFP2 for refueling purposes. The criticality analysis determined that a boron concentration of 800 ppm (non-accident) and 1,900 ppm (accident) results in a $k_{eff} < 0.95$. This provides substantial margin against any new type of criticality event.

Extending the Technical Specification controls for the soluble boron to include additional margin above the required amounts to prevent a boron dilution event will not create the possibility of a new or different kind of accidental pool dilution.

The potential for criticality in the spent fuel pool is not a new or different type of accident. The 3 out of 4 configuration for storage of fuel exposed to power operation up to 3612 MWt has been analyzed to demonstrate that the pool remains subcritical. In addition, since the TS 3.7.17 limits for uprate fuel assemblies are more conservative than the pre-uprate limits, any configuration containing uprate fuel will be less reactive relative to the fuel configuration assumed in the 2001 analysis. Therefore the previous analysis remain bounding, including both the misloading accident (which is limited by the placement of a fresh fuel assembly) and a dilution accident. Misplacing a fuel assembly which does not satisfy the requirements based on Power History (for example placing an Uprate fuel assembly into a 4 out of 4 configuration), is not a new kind of accident. This is the same kind of accident as a TS 3.7.17 violation prior to the uprate.

There is no significant change in plant configuration, equipment design, or usage of plant equipment. The safety analysis for boron dilution remains bounding; however, the criticality analyses assure that the pool will remain subcritical with no credit for soluble boron. Therefore, the proposed changes will not create the possibility of a new or different kind of accident.

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

3. Do the proposed changes involve a significant reduction in a margin of safety?

Response: No

Proposed Technical Specifications 3.7.17 and 4.3 and the associated fuel storage requirements will provide adequate margin to assure that the fuel storage array in Region II will remain subcritical by the margins required in 10CR50.68.

The criticality analysis for Region II utilized credit for soluble boron, the storage configurations have been defined using k_{eff} calculations to ensure that the spent fuel storage k_{eff} will be less than 1.0 with no soluble boron. Soluble boron credit is used to offset off-normal conditions (such as a misplaced assembly) and to provide subcritical margin such that the fuel storage pool k_{eff} is maintained less than or equal to 0.95. The loss of substantial amount of soluble boron from the spent fuel pools which could lead to exceeding a k_{eff} of 0.95 has been evaluated and shown not to be credible. These evaluations show that the dilution of the spent fuel pools boron concentration from 1,900 ppm to 800 ppm is not credible and that the Region II spent fuel storage k_{eff} will remain less than 1.0 when flooded with unborated water.

Therefore the proposed change does not involve a reduction in a margin of safety.

Based on the above evaluations, Luminant Power concludes that the proposed amendment(s) present no significant hazards under the standards set forth in 10CFR50.92(c) and, accordingly, a finding of "no significant hazards consideration" is justified.

5.2 Applicable Regulatory Requirements/Criteria

Criterion 2 of 10 CFR 50.36(c)(2)(ii), "A technical specification limiting condition for operation of a nuclear reactor must be established for each item meeting one or more of the following criteria: ..... A process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier."

GDC 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."

GDC 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."

NUREG-0800, Standard Review Plan 9.1.2, "Spent Fuel Storage": "Nuclear reactor plants include storage facilities for the wet storage of spent fuel assemblies. The safety function of the spent fuel pool and storage racks is to maintain the spent fuel assemblies in a safe and subcritical array during all credible storage conditions and to provide a safe means of loading the assemblies into shipping casks."

> 10 CFR 50.68 (b)(4):"If no credit for soluble boron is taken, the k-effective of the spent fuel storage racks loaded with fuel of the maximum fuel assembly reactivity must not exceed 0.95, at a 95 percent probability, 95 percent confidence level, if flooded with unborated water. If credit is taken for soluble boron, the k-effective of the spent fuel storage racks loaded with fuel of the maximum fuel assembly reactivity must not exceed 0.95, at a 95 percent probability, 95 percent confidence level, if flooded with borated water, and the k-effective must remain below 1.0 (subcritical), at a 95 percent probability, 95 percent confidence level, if flooded with unborated water."

The proposed changes to include fuel exposed to 3612 MWt for storage in the spent fuel storage pools does not change the compliance with the above general design criteria and are also consistent with the above Standard Review Plan.

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

Luminant Power has determined that the proposed amendment would change requirements with respect to the installation or use of a facility component located within the restricted area, as defined in 10CFR20, or would change an inspection or surveillance requirement. Luminant Power has evaluated the proposed changes and has determined that the changes do not involve (1) a significant hazards consideration, (2) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (3) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed changes meet the eligibility criterion for categorical exclusion set forth in 10CFR51.22(c)(9).

Therefore, pursuant to 10CFR51.22(b), an environmental assessment of the proposed change is not required.

7.0 REFERENCES

7.1 CAB-00-163 Revision 2, "Comanche Peak High Density Spent Fuel Rack Criticality Analysis Using Soluble Boron Credit and No Outer Wrapper Plates"

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

7.3 COMANCHE PEAK STEAM ELECTRIC STATION (CPSES), UNITS 1 AND 2 - ISSUANCE OF AMENDMENTS RE: INCREASE IN SPENT FUEL STORAGE CAPACITY TO 3,373 FUEL ASSEMBLIES (TAC NOS. MB0207 AND MB0208), October 2, 2001 (ML012560143)

7.4 SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION RELATED TO AMENDMENT NOS. 46 AND 32 TO FACILITY OPERATING LICENSE NOS. NPF-87 AND NPF-89 TEXAS UTILITIES ELECTRIC COMPANY COMANCHE PEAK STEAM ELECTRIC STATION, UNITS 1 AND 2 DOCKET NOS. D 50-446, February 9, 1996 (ML021790670)

7.5 Letter from S. Dembek, U.S. NRC, to H. Sepp, Westinghouse Electric Company, "Non-Conservatism in Axial Burnup Biases for Spent Fuel Rack Criticality Analysis Methodology," dated July 27, 2001 (ML012080337)

7.6 Letter logged TXX-12148 from Rafael Flores (Luminant Power) to the NRC (document Control Desk) dated October 9, 2012 regarding Spent Fuel Pool Criticality Analysis (ML12292A193)

7.7 Letter logged NF-TB-12-124, dated December 14, 2012, from Westinghouse Electric Company to Luminant Power regarding Spent Fuel Pool Criticality Analysis of Record Expansion to Include Uprate Fuel (Enclosure 1 to TXX-13001) (Proprietary)

7.8 SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION RELATED TO AMENDMENT NO. 146 TO FACILITY OPERATING LICENSE NOS. NPF-87 AND NPF-89 TEXAS UTILITIES ELECTRIC COMPANY COMANCHE PEAK STEAM ELECTRIC STATION, UNITS 1 AND 2 DOCKET NOS. 5—445 AND 50-446, June 27, 2008 (ML081510173)

ATTACHMENT 2 to TXX-13001

PROPOSED TECHNICAL SPECIFICATION CHANGES (MARK-UP)

3.7 PLANT SYSTEMS

3.7.16 Fuel Storage Pool Boron Concentration

2400

LCO 3.7.16 The fuel storage pool boron concentration shall be ≥ ~~2000~~ ppm.

APPLICABILITY: When fuel assemblies are 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

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.16.1	Verify the fuel storage pool boron concentration is within limit.	In accordance with the Surveillance Frequency Control Program.

3.7 PLANT SYSTEMS

3.7.17 Spent Fuel Assembly Storage

power history

LCO 3.7.17 The combination of initial enrichment, burnup and ~~decay time~~ of each spent fuel assembly stored in Region II racks shall be within either (1) the "acceptable" domain of Figure 3.7.17-1 in a 4 out of 4 configuration, (2) the "acceptable" domain of Figure 3.7.17-2 in a 3 out of 4 configuration, (3) the "acceptable" domain of Figure 3.7.17-3 in a 2 out of 4 configuration, or (4) shall be stored in a 1 out of 4 configuration. The acceptable storage configurations are shown in Figure 3.7.17-4.

APPLICABILITY: Whenever any fuel assembly is stored in Region II racks of the spent 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 to an acceptable storage location.	 Immediately

Storage of fuel assemblies in Region II of the spent fuel pool shall be limited to fuel assemblies discharged from Unit 1 Cycle 16, Unit 2 Cycle 14 and prior operating cycles.

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.17.1	Verify by administrative means the initial enrichment, burnup and ~~decay time~~ power history of the fuel assembly is in accordance with either (1) the "acceptable" domain of Figure 3.7.17-1 in a 4 out of 4 configuration, (2) the "acceptable" domain of Figure 3.7.17-2 in a 3 out of 4 configuration, (3) the "acceptable" domain of Figure 3.7.17-3 in a 2 out of 4 configuration, or (4) a 1 out of 4 configuration. The acceptable storage configurations are shown in Figure 3.7.17-4.	Prior to storing the fuel assembly in Region II racks

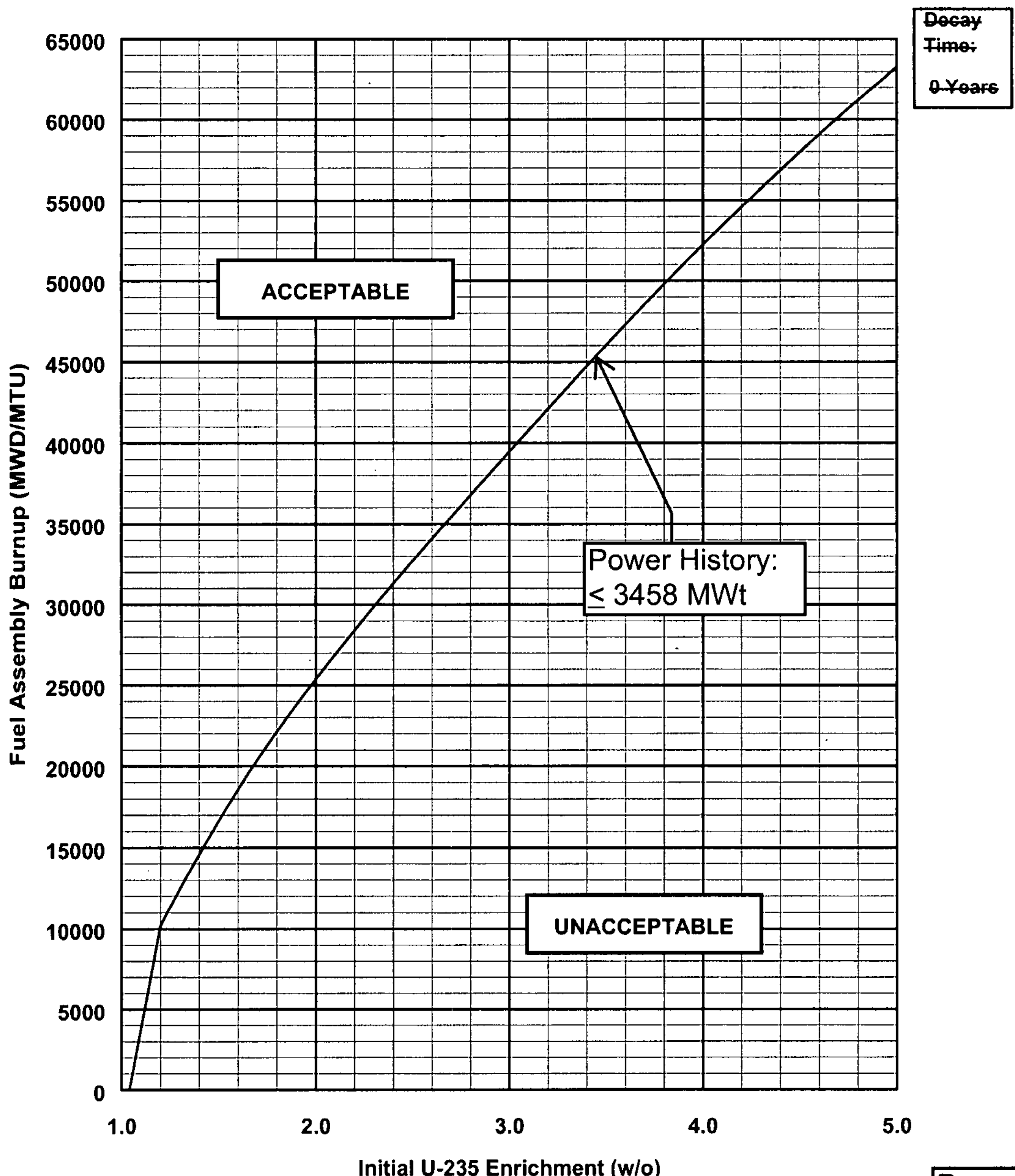


Figure 3.7.17-1 (page 1 of 1)
Fuel Assembly Burnup vs. U-235 Enrichments vs. ~~Decay Time~~ Power History Limits
For a 4 out of 4 Storage Configuration in Region II Racks

Insert New Figure 3.7.17-2

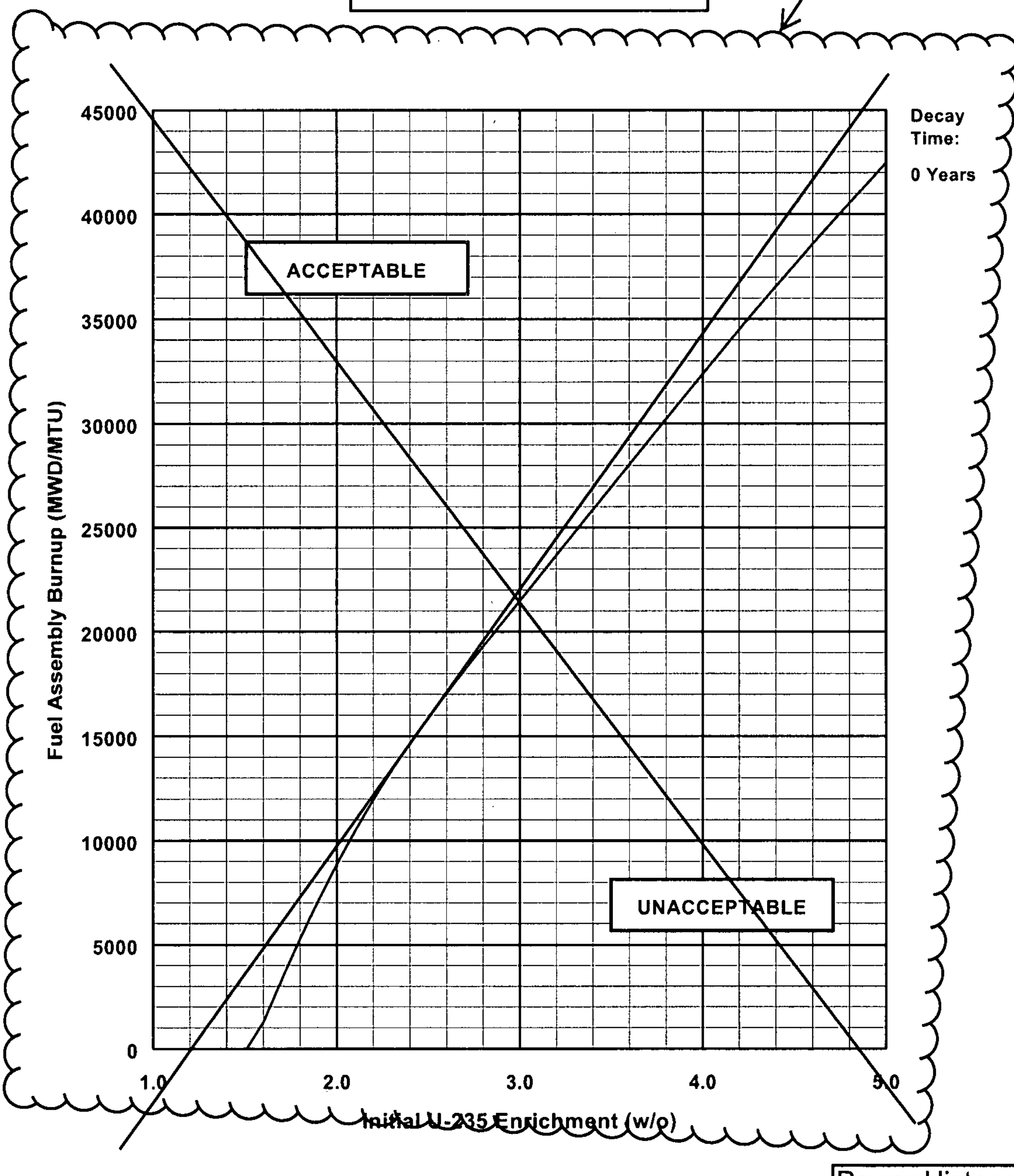
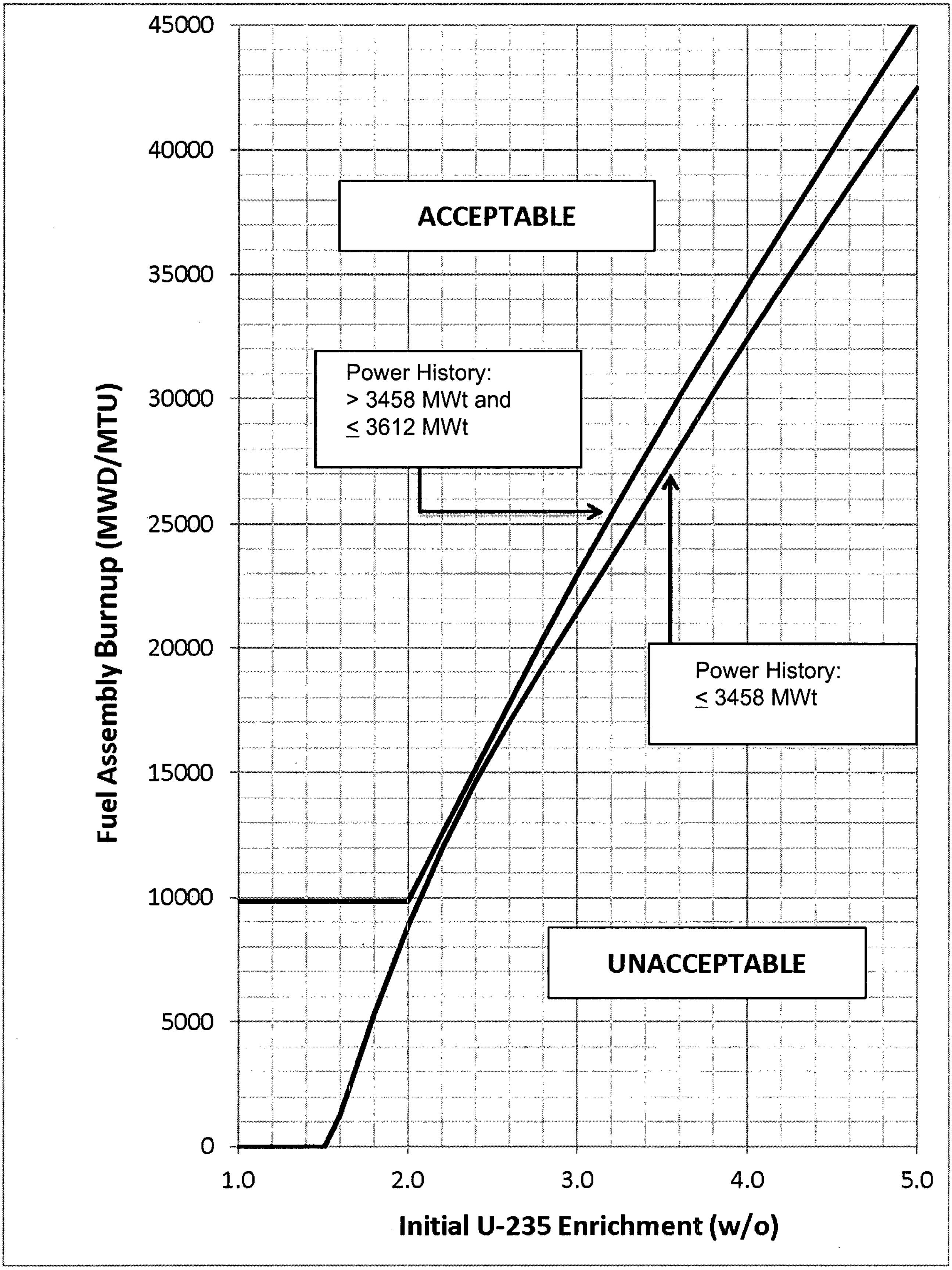


Figure 3.7.17-2 (page 1 of 1)
Minimum Burnup vs. Initial U-235 Enrichment vs. ~~Decay Time~~ Power History Limits
For a 3 out of 4 Storage Configuration in Region II Racks

New Figure 3.7.17-2



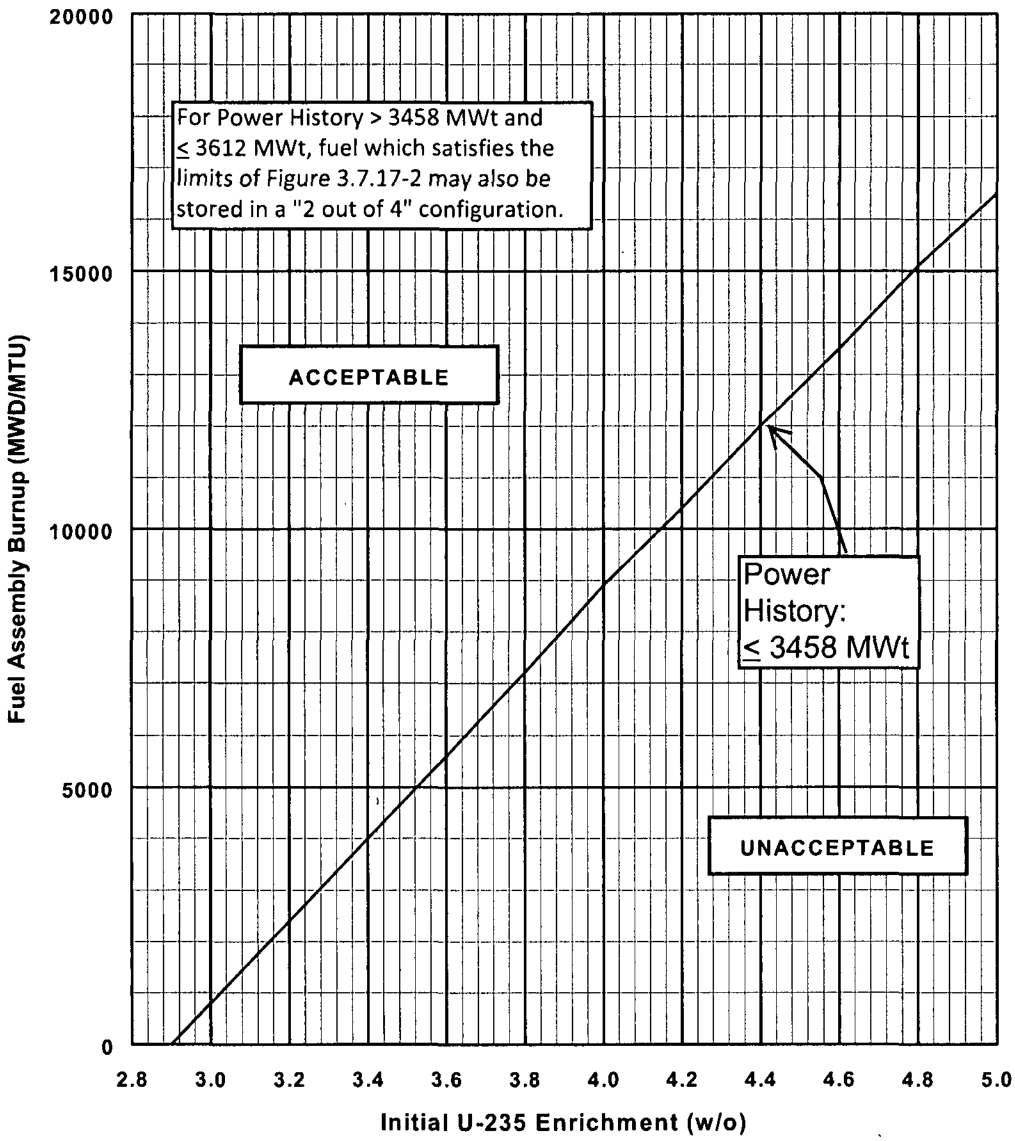


Figure 3.7.17-3 (page 1 of 1)
Minimum Burnup vs. Initial U-235 Enrichment vs. Power History Limits
For a 2 out of 4 Storage Configuration in Region II Racks

5.5 Programs and Manuals

5.5.21 Surveillance Frequency Control Program

This program provides controls for Surveillance Frequencies. The program shall ensure that Surveillance Requirements specified in the Technical Specifications are performed at intervals sufficient to assure the associated Limiting Conditions for Operation are met.

a. The Surveillance Frequency Control Program shall contain a list of Frequencies of those Surveillance Requirements for which the Frequency is controlled by the program.

b. Changes to the Frequencies listed in the Surveillance Frequency Control Program shall be made in accordance with NEI-04-10, "Risk-Informed Method for Control of Surveillance Frequencies," Revision 1.

c. The provisions of Surveillance Requirements 3.0.2 and 3.0.3 are applicable to the Frequencies established in the Surveillance Frequency Control Program.

INSERT

INSERT

5.5.22 Spent Fuel Assembly Dispersion Program

Administrative controls are used to maintain a less reactive configuration in the spent fuel pool Region II storage racks than is allowed by TS 3.7.17. This program prevents storing several "low margin" fuel assemblies (fuel with relatively low values of excess reactivity margin) in the same area within the storage racks, and therefore makes it necessary to disperse the low margin fuel within fuel assemblies with higher levels of reactivity margin.

a. Prior to changing the configuration of fuel within the Region II storage racks, the minimum calculated value of Average Excess Margin is compared to an established baseline.

b. A value of excess margin provides a relative measure of margin beyond the spent fuel pool criticality analysis, and is determined for each fuel assembly to be stored in Region II. The excess margin is based on the following values:

   1. The Excess Margin due to Excess Fuel Burnup is calculated as follows:
      - Excess Burnup = [actual burnup (MWD/MTU)] - [minimum value required for storage in the assembly's Maximum Allowable Storage Configuration per TS 3.7.17 (MWD/MTU)]
      - Excess Margin = [Excess Burnup] x 323 pcm / 1,000 MWD/MTU

   2. The Excess Margin due to Decay Time is calculated as follows:
      - Excess Margin = 112 pcm x [decay time in years], for decay time < 20 years
      - Excess Margin = 2240 pcm, for decay time ≥ 20 years

c. No two assemblies with an Excess Margin value < 1000 pcm will be stored adjacent to each other (including diagonally). In this case, the fuel move plans are altered to place the low margin assemblies further apart.

d. A value of Average Excess Margin is determined for each fuel assembly by averaging the sum of the applicable margins for all adjacent fuel assemblies.
   - For each assembly, the Average Excess Margin is the average values of Excess Margin for all assemblies stored in a 3x3 array, centered on the fuel assembly.
   - This step is intended to identify areas in the SFP where multiple assemblies with low excess margin are stored in close proximity, and therefore does not apply for fuel stored in a "1 out of 4" configuration.

e. If the minimum value of Average Excess Margin in the Region II storage racks is determined to be < 2000 pcm, then the fuel move plans are altered to provide additional excess margin.

ATTACHMENT 3 to TXX-13001

PROPOSED TECHNICAL SPECIFICATIONS BASES CHANGES
(Markup For Information Only)

Pages: Inserts for Bases
B 3.7-72
B 3.7-73
B 3.7-74
B 3.7-75
B 3.7-76
B 3.7-77
B 3.7-78
B 3.7-79

INSERT 1

The "Power History" requirements associated with Figure 3.7.17-1, Figure 3.7.17-2, and Figure 3.7.17-3 refer to the highest value of Rated Thermal Power for any fuel cycle which contained the assembly. Figure 3.7.17-1 only contains a limit associated with a Power History ≤ 3458 MWt. This limits fuel assemblies which have been depleted in a fuel cycle with a Rated Thermal Power higher than 3458 MWt to a less dense storage configuration. Figure 3.7.17-3 only contains a burnup limit curve associated with a Power History ≤ 3458 MWt, but includes a note explaining that fuel with Power History ≤ 3612 MWt may be stored in "2 out of 4" if the limits of Figure 3.7.17-2 are satisfied. Therefore, fuel which has been depleted with a Rated Thermal Power higher than 3458 MWt must satisfy the limitations for "3 out of 4" storage to be stored in either a "2 out of 4" or "3 out of 4" configuration.

INSERT 2

Figures 3.7.17-1 through 3.7.17-3 contain a limitation on Power History, which refers to the highest value of Rated Thermal Power for any fuel cycle which the fuel assembly was depleted in. A fuel assembly has a Power History of 3612 MWt if it was included in Unit 1 Cycle 14, Unit 2 Cycle 12, or any more recent fuel cycle.

Region II storage is only applicable for fuel assemblies discharged from Unit 1 Cycle 16, Unit 2 Cycle 14 and prior operating cycles for Units 1 and 2.

B 3.7 PLANT SYSTEMS

B 3.7.16 Fuel Storage Pool Boron Concentration

BASES

BACKGROUND

A common Fuel Building houses facilities for storage and transfer of new and spent fuel. Two pools are provided for CPSES spent fuel storage. Each pool may be used to store fuel from either or both of the CPSES units.

power history

In the Region II rack (References 1 and 2) design, the spent fuel storage pool numbers 1 and 2 (SFP1 and SFP2) permit four different configurations (as shown in Figure 3.7.17-4) which, for the purpose of criticality considerations, are considered as separate pools. Region II racks, with 1462 and 1470 storage positions in SFP1 and SFP2 respectively (2932 total), are designed to accommodate fuel of various initial enrichments which have accumulated minimum burnups and ~~decay times~~ within either (1) the "acceptable" domain of Figure 3.7.17-1 in a 4 out of 4 configuration, (2) the "acceptable" domain of Figure 3.7.17-2 in a 3 out of 4 configuration, (3) the "acceptable" domain of Figure 3.7.17-3 in a 2 out of 4 configuration, or (4) a 1 out of 4 configuration as shown in Figure 3.7.17-4.

power history

Region I racks (References 1 and 2) with 222 and 219 storage positions located in SFP1 and SFP2 respectively (441 total), constitute a fifth configuration within the pools. These Region I racks are designed to accommodate new fuel with a maximum enrichment of 5.0 w/t % U-235 or spent fuel regardless of the discharge fuel burnup or ~~decay time~~. Soluble boron is not credited for the storage of spent fuel assemblies within the Region I racks, and there are no storage pattern restrictions associated with the Region I racks. The neutron absorber material Boral is credited for the storage of spent fuel assemblies within the Region I racks to maintain k_{eff} less than or equal to 0.95.

Soluble boron is not credited for the storage of fuel assemblies within the Region II racks in the 1 out of 4 and 2 out of 4 configurations. Criticality analyses have been performed (Reference 2) which demonstrate that the multiplication factor, k_{eff}, of the fuel and spent fuel storage racks is less than or equal to 0.95.

In order to maintain k_{eff} less than or equal to 0.95, the presence of fuel pool soluble boron is credited for the storage of fuel assemblies within the Region II racks in the 3 out of 4 and 4 out of 4 configurations. A description of how credit for fuel storage pool soluble boron is used under normal storage configuration conditions is found in References 2, 3, and 4. The storage configuration is defined using calculations to ensure that k_{eff} will be less than 1.0 with no soluble boron under normal storage conditions including

(continued)

BASES

BACKGROUND (continued)

power history

tolerances and uncertainties. Soluble boron credit is then used to maintain k_{eff} less than or equal to 0.95. Criticality analyses have been performed (Reference 3) which demonstrate that the pools require 800 ppm of soluble boron to maintain k_{eff} less than or equal to 0.95 for all allowed combinations of storage configurations, enrichments, burnups, and ~~decay time~~ limits. The effect of B-10 depletion on the boron concentration for maintaining k_{eff} less than or equal to 0.95 is negligible.

Criticality analyses considering accident conditions have also been performed (References 2 and 3). These analyses establish the amount of soluble boron necessary to ensure that k_{eff} will be maintained less than or equal to 0.95 should pool temperatures fall outside the assumed range or a fuel assembly misload occur. The total amount of soluble boron required to mitigate these events is 1900 ppm.

For an occurrence of the above postulated accident condition, the double contingency principle of ANSI/ANS 8.1-1983 (Reference 6) can be applied. This states that one is not required to assume two unlikely, independent, concurrent events to ensure protection against a criticality accident. Thus, for these postulated accident conditions, the presence of additional soluble boron in the storage pool water (above the concentration required for normal conditions and reactivity equivalencing) can be assumed as a realistic initial condition since not assuming its presence would be a second unlikely event.

A boron concentration of ≥2400 ppm provides additional excess margin for the boron dilution analysis.

A boron concentration equal to or greater than 2000 ppm assures that a dilution event which will result in a k_{eff} greater than 0.95 is not credible. This is demonstrated by a boron dilution analysis performed for the CPSES Spent Fuel pools. This conclusion is based on the following: (1) a substantial amount of water is needed in order to dilute the SFP to the design k_{eff} of 0.95, (2) since such a large water volume turnover is required, a SFP dilution event would be readily detected by plant personnel via alarms, flooding in the fuel and auxiliary buildings or by normal operator rounds through the SFP area, and (3) evaluations indicate that, based on the flow rates of non-borated water normally available to the SFP, taken in conjunction with significant operator errors, and equipment failures, sufficient time is available to detect and respond to a dilution event. In addition, there is significant conservatism built into this evaluation; for example, the cooling of the spent fuel pools can be performed by one train supplying common water to both pools. This cooling configuration would allow credit of the volume of both pools and substantially increase the dilution time estimates presented. However, because the flexibility exists for the cooling system to be totally dedicated to one pool, only one pool volume is considered in this evaluation.

(continued)

BASES

BACKGROUND (continued)

It should be noted that this boron dilution evaluation considered the boron dilution volumes required to dilute the SFP from 1900 ppm to 800 ppm. The 800 ppm end point was utilized to ensure that k_{eff} for the spent fuel racks would remain less than or equal to 0.95. However, as discussed above, calculations for Region II 3 out of 4 and 4 out of 4 configurations have been performed on a 95/95 basis to show that the spent fuel rack k_{eff} remains less than 1.0 with non-borated water in the pool. Thus, even if the SFP were diluted to concentrations approaching zero ppm, the fuel in the Region II racks would remain subcritical and the health and safety of the public would be protected.

The storage of fuel with initial enrichments up to and including 5.0 weight percent U-235 in the Comanche Peak fuel storage pools has been evaluated. For the Region II storage racks, the resulting enrichment, burnup, and ~~decay time~~ power history limits for the pool are shown in Figures 3.7.17-1 through 3.7.17-4.

APPLICABLE SAFETY ANALYSES

Most fuel storage pool accident conditions will not result in a significant increase in k_{eff}. Examples of such accidents are the drop of a fuel assembly on top of a rack, and the drop of a fuel assembly outside but adjacent to the rack modules.

A dropped assembly accident occurs when a fuel assembly is dropped onto the storage racks. The rack structure is not excessively deformed. An assembly, in its most reactive condition, is considered in the criticality evaluation. Accident analyses have been performed which demonstrate that the dropped assembly which comes to rest horizontally on top of the rack has sufficient water separating it from the active fuel height of stored assemblies to preclude neutronic interaction. This is true even with unborated water. For the borated water condition, the potential for interaction is even less since the water contains boron which is an additional thermal neutron absorber.

However, three accidents can be postulated for each storage configuration that could increase reactivity beyond the analyzed condition. The first postulated accident would be a change in pool temperature to outside the range of normal operating temperatures assumed in the criticality analyses (50°F to 150°F). The second accident would be dropping a fuel assembly into an already loaded cell. The third would be the misloading of a fuel assembly within the racks into a cell for which the restrictions on location, enrichment, burnup, or ~~decay time~~ power history are not satisfied or adjacent to but outside the racks.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

Variations in the temperature of the water passing through the stored fuel assemblies outside the normal operating range were considered in the criticality analysis. The reactivity effects of a temperature range from 32°F to 212°F were evaluated. The increase in reactivity due to the change in temperature is bounded by the misloading accident.

For the accident of dropping a fuel assembly into an already loaded cell, the upward axial leakage of that cell will be reduced; however, the overall effect on the rack reactivity will be insignificant. This is because minimizing the upward-only leakage of just a single cell will not cause any significant increase in reactivity. Furthermore, the neutronic coupling between the dropped assembly and the already loaded assembly will be low due to several inches of assembly nozzle structure which would separate the active fuel regions. Therefore, this accident would clearly be bounded by the misloading accident.

The fuel assembly misloading accident involves placement of a fuel assembly in a location for which it does not meet the requirements for enrichment, burnup, or ~~decay time~~ [power history] including the placement of an assembly in a location that is required to be left empty. The result of the misloading is to add positive reactivity, increasing k_{eff} toward 0.95. The maximum required boron to compensate for this event is 1900 ppm, which is below the LCO limit of ~~2000~~ [2400] ppm.

The concentration of dissolved boron in the fuel storage pool satisfies Criterion 2 of the 10CFR50.36(c)(2)(ii).

LCO

The fuel storage pool boron concentration is required to be ≥ ~~2000~~ [2400] ppm. The specified concentration of dissolved boron in the fuel storage pool preserves the assumptions used in the analyses of the potential criticality accident scenarios as described in Reference 5. The amount of soluble boron [A] required to offset each of the above postulated accidents was evaluated for all of the proposed storage configurations. ~~The specified minimum~~ [A specified] boron concentration of 2000 ppm assures that the concentration will remain above these values. [A specified boron concentration of ≥2400 ppm in the LCO provides excess margin above 2000 ppm boron concentration.]

APPLICABILITY

This LCO applies whenever fuel assemblies are stored in the spent fuel storage pool.

(continued)

BASES (continued)

ACTIONS

A.1 and A.2

When the concentration of boron in the fuel storage pool is less than required, immediate action must be taken to preclude the occurrence of an accident or to mitigate the consequences of an accident in progress. This action is most efficiently achieved by immediately suspending the movement of fuel assemblies. The concentration of boron is restored simultaneously with suspending movement of fuel assemblies. Prior to resuming movement of fuel assemblies, the concentration of boron must be restored. This requirement does not preclude movement of a fuel assembly to a safe position.

The Required Actions are modified by a Note indicating that LCO 3.0.3 does not apply. If the LCO is not met while moving irradiated fuel assemblies in MODE 5 or 6, LCO 3.0.3 would not be applicable. 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.

SURVEILLANCE REQUIREMENTS

SR 3.7.16.1

This SR verifies that the concentration of boron in the fuel storage pool is within the required limit. As long as this SR is met, the analyzed accidents are fully addressed. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. FSAR, Section 9.1.
2. License Amendment Requests 94-22, 98-08, and 00-05, Spent Fuel Storage Capacity Increase, Docket NOS 50-445 and 50-446, CPSES.
3. Comanche Peak High Density Spent Fuel Rack Criticality Analysis using Soluble Boron Credit and No Outer Wrapper Plate, dated July, 2001 (Enclosure 2 to TXX-01118).
4. WCAP-14416 NP-A, Rev. 1, "Westinghouse Spent Fuel Rack Criticality Analysis Methodology," November 1996.
5. FSAR, Section 15.7.4.
6. American Nuclear Society, "American National Standard for Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors," ANSI/ANS-8.1-1983, October 7, 1983.

B 3.7 PLANT SYSTEMS

B 3.7.17 Spent Fuel Assembly Storage

BASES

BACKGROUND

A common Fuel Building houses facilities for storage and transfer of new and spent fuel. Two pools are provided for CPSES spent fuel storage. Each pool may be used to store fuel from either or both of the CPSES units.

In the Region II rack (References 1 and 2) design, the spent fuel storage pool numbers 1 and 2 (SFP1 and SFP2) permit four different configurations (as shown in Figure 3.7.17-4) which, for the purpose of criticality considerations, are considered as separate pools. Region II racks, with 1462 and 1470 storage positions in SFP1 and SFP2 respectively (2932 total), are designed to accommodate fuel [power history] of various initial enrichments which have accumulated minimum burnups and ~~decay times~~ within either (1) the "acceptable" domain of Figure 3.7.17-1 in a 4 out of 4 configuration, (2) the "acceptable" domain of Figure 3.7.17-2 in a 3 out of 4 configuration, (3) the "acceptable" domain of Figure 3.7.17-3 in a 2 out of 4 configuration, or (4) a 1 out of 4 configuration as shown in Figure 3.7.17.4.

[INSERT 1]

Region I racks (References 1 and 2) with 222 and 219 storage positions located in SFP1 and SFP2 respectively (441 total) constitute a fifth configuration within the pools. These Region I racks are designed to accommodate new fuel with a maximum enrichment of 5.0 w/t % U-235 or spent fuel regardless of the discharge fuel burnup. Soluble boron is not credited for the storage of spent fuel assemblies within the Region I racks, and there are no storage pattern restrictions associated with the Region I racks. The neutron absorber material Boral is credited for the storage of spent fuel assemblies within the Region I racks to maintain k_{eff} less than or equal to 0.95.

A discussion of how soluble boron is credited for the storage of spent fuel assemblies is contained in the BACKGROUND for B 3.7.16.

Within the SFP1 Region II racks, there exist two oversized (2x2) cells. Within the SFP2 Region I racks, there exists one oversized (2x2) cell. These oversized cells are not approved for storage of either fresh or spent fuel. However, they can be used as a place in the pool for an assembly to be lowered and raised while being inspected. Prior to use of the inspection cells certain prerequisites must be met. Criticality analyses (Reference 3) have been performed which demonstrate that there is no increase in reactivity relative to the approved Region II storage configurations (the current licensing basis requirements for the spent fuel pool are still met) provided that administrative prerequisites are maintained for the oversized cells in

(continued)

BASES

BACKGROUND (continued)

SFP1 Region II racks. The prerequisite for the use of the oversized cells in Region II racks is that all the Region II cells in the first row surrounding the oversized cell remain empty. This results in a total of 8 empty Region II cells adjacent to the oversized cell in the SFP I Region II rack adjacent to the Region I rack and a total of 5 empty Region II cells adjacent to the oversized cell in the SFP1 Region II racks adjacent to the spent fuel pool walls. There are no prerequisites for the use of the oversized cell in SFP2 Region I racks since the criticality analyses (Reference 3) demonstrate there is no increase in reactivity relative to the approved Region I storage configuration.

APPLICABLE SAFETY ANALYSES

A discussion of the criticality analysis for the storage of spent fuel assemblies is contained in the APPLICABLE SAFETY ANALYSES for B 3.7.16.

Most fuel storage pool accident conditions will not result in a significant increase in k_{eff}. Examples of such accidents are the drop of a fuel assembly on top of a rack, and the drop of a fuel assembly outside but adjacent to the rack modules. However, accidents can be postulated for each rack storage configuration which could increase reactivity beyond the analyzed condition. A discussion of these accidents is contained in B 3.7.16.

By closely controlling the movement of each assembly and by checking the location of each assembly after movement, the time period for potential accidents may be limited to a small fraction of the total operating time.

The configuration of fuel assemblies in the fuel storage pool satisfies Criterion 2 of 10CFR50.36(c)(2)(ii).

LCO

The restrictions on the placement of fuel assemblies within the spent fuel pool, in accordance with Figures 3.7.17-1 through 3.7.17-4, in the accompanying LCO, ensures the k_{eff} of the spent fuel storage pool will always remain ≤ 0.95, assuming the pool to be flooded with borated water.

NOTE: The oversized inspection cells within the racks are not approved storage locations and are not covered by the LCO. Administrative controls which govern the use of the inspections cells are described in the BACKGROUND.

(continued)

BASES (continued)

APPLICABILITY	This LCO applies whenever any fuel assembly is stored in Region II racks of the fuel storage pool. ← INSERT 2
ACTIONS	A.1 When the configuration of fuel assemblies stored in Region II racks of the spent fuel storage pool is not in accordance with Figures 3.7.17-1 through 3.7.17-4, the immediate action is to initiate action to make the necessary fuel assembly movement(s) to bring the configuration into compliance with Figures 3.7.17-1 through12 3.7.17-4. Required Action A.1 is modified by a Note indicating that LCO 3.0.3 does not apply. If unable to move irradiated fuel assemblies while in MODE 5 or 6, LCO 3.0.3 would not be applicable. If unable to move irradiated fuel assemblies while in MODE 1, 2, 3, or 4, the action is independent of reactor operation. Therefore, inability to move fuel assemblies is not sufficient reason to require a reactor shutdown.
SURVEILLANCE REQUIREMENTS	SR 3.7.17.1 This SR verifies, by administrative means, that the initial enrichment, burnup and ~~decay time~~ [power history] of the fuel assembly is in accordance with Figures 3.7.17-1 through 3.7.17-4 in the accompanying LCO.
REFERENCES	1. FSAR Section 9.1. 2. License Amendment Request 94-22, 98-08, and 00-05 Spent Fuel Storage Capacity Increase, Docket Nos. 50-445 and 50-446, CPSES. 3. Criticality Safety Analysis of Holtec Spent Fuel Racks, dated January, 2003 (Holtec Report HI-2002436, Revision 9).

ATTACHMENT 4 to TXX-13001

RETYPED TECHNICAL SPECIFICATION PAGES

Pages	3.7-36
	3.7-37
	3.7-38
	3.7-39
	3.7-40
	3.7-41
	3.7-42
	5.5-17
	5.5-18

3.7 PLANT SYSTEMS

3.7.16 Fuel Storage Pool Boron Concentration

LCO 3.7.16 The fuel storage pool boron concentration shall be ≥ 2400 ppm.

APPLICABILITY: When fuel assemblies are stored in the fuel storage pool.

ACTIONS

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

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.16.1	Verify the fuel storage pool boron concentration is within limit.	In accordance with the Surveillance Frequency Control Program.

3.7 PLANT SYSTEMS

3.7.17 Spent Fuel Assembly Storage

LCO 3.7.17 The combination of initial enrichment, burnup and power history of each spent fuel assembly stored in Region II racks shall be within either (1) the "acceptable" domain of Figure 3.7.17-1 in a 4 out of 4 configuration, (2) the "acceptable" domain of Figure 3.7.17-2 in a 3 out of 4 configuration, (3) the "acceptable" domain of Figure 3.7.17-3 in a 2 out of 4 configuration, or (4) shall be stored in a 1 out of 4 configuration. The acceptable storage configurations are shown in Figure 3.7.17-4. Storage of fuel assemlies in Region II of the spent fuel pool shall be limited to fuel assemblies discharged from Unit 1 Cycle 16, Unit 2 Cycle 14 and prior operating cycles.

APPLICABILITY: Whenever any fuel assembly is stored in Region II racks of the spent 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 to an acceptable storage location.	 Immediately

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.7.17.1	Verify by administrative means the initial enrichment, burnup and power history of the fuel assembly is in accordance with either (1) the "acceptable" domain of Figure 3.7.17-1 in a 4 out of 4 configuration, (2) the "acceptable" domain of Figure 3.7.17-2 in a 3 out of 4 configuration, (3) the "acceptable" domain of Figure 3.7.17-3 in a 2 out of 4 configuration, or (4) a 1 out of 4 configuration. The acceptable storage configurations are shown in Figure 3.7.17-4.	Prior to storing the fuel assembly in Region II racks

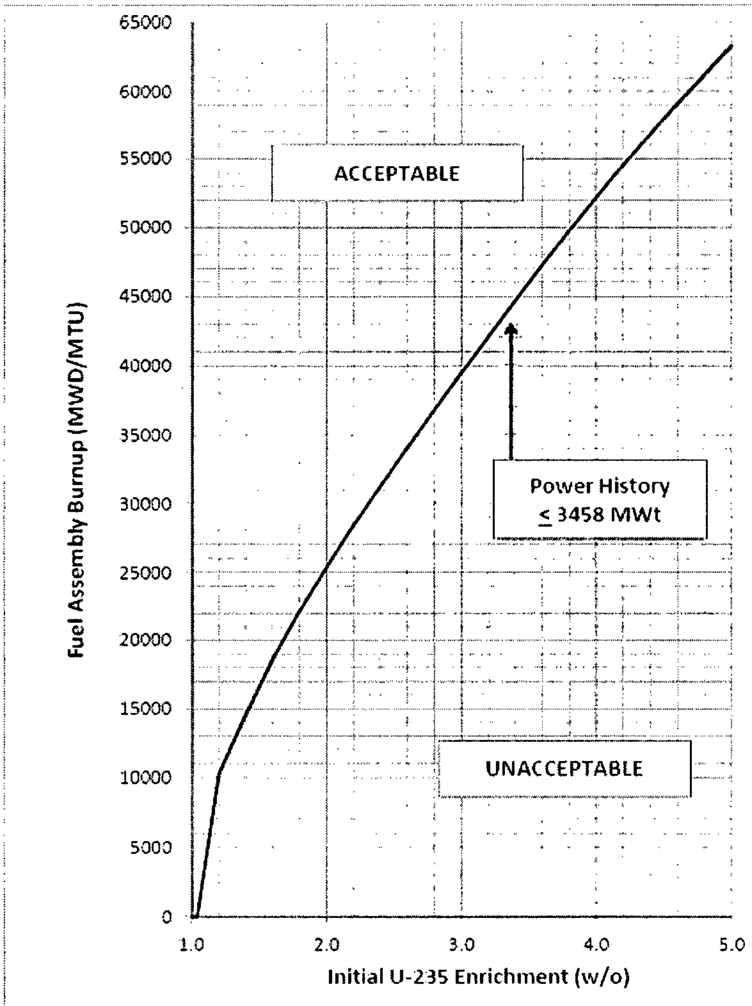


Figure 3.7.17-1 (page 1 of 1)
Fuel Assembly Burnup vs. U-235 Enrichments vs. Power History Limits
For a 4 out of 4 Storage Configuration in Region II Racks

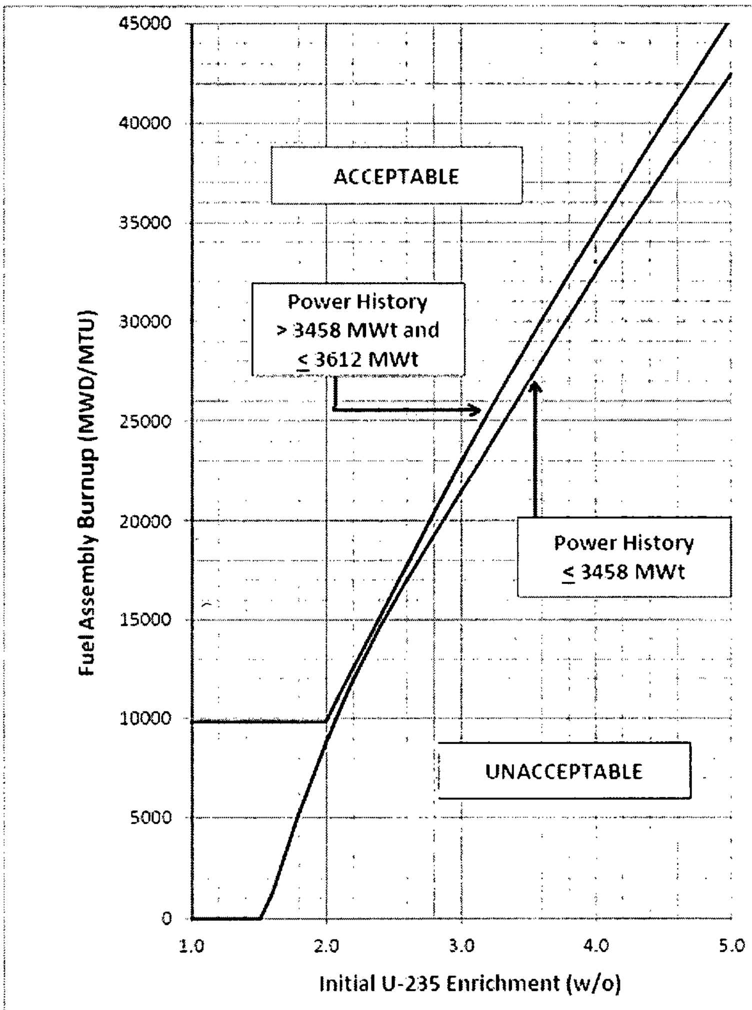


Figure 3.7.17-2 (page 1 of 1)
Minimum Burnup vs. Initial U-235 Enrichment vs. Power History Limits
For a 3 out of 4 Storage Configuration in Region II Racks

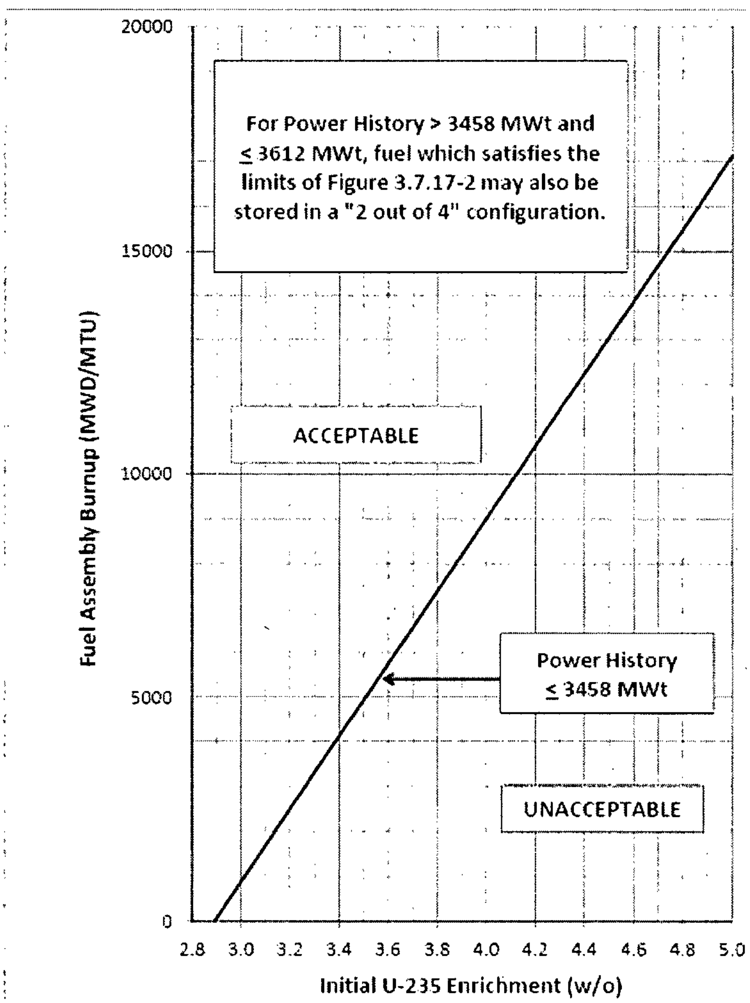


Figure 3.7.17-3 (page 1 of 1)
Minimum Burnup vs. Initial U-235 Enrichment vs. Power History Limits
For a 2 out of 4 Storage Configuration in Region II Racks

Page included for Information

A	A	A	A	A	A
A	A	A	A	A	A
A	A	A	A	A	A
A	A	A	A	A	A
A	A	A	A	A	A
A	A	A	A	A	A

	B		B		B
B	B	B	B	B	B
	B		B		B
B	B	B	B	B	B
	B		B		B
B	B	B	B	B	B

C		C		C	
	C		C		C
C		C		C	
	C		C		C
C		C		C	
	C		C		C

	D		D		D
	D		D		D
	D		D		D

A — Region II (4/4), new or partially spent fuel assemblies in the "acceptable" domain of Figure 3.7.17-1.

B — Region II (3/4), new or partially spent fuel assemblies in the "acceptable" domain of Figure 3.7.17-2.

C — Region II (2/4), new or partially spent fuel assemblies in the "acceptable" domain of Figure 3.7.17-3.

D — Region II (1/4), new or partially spent fuel assemblies which are stored in an expanded checkerboard (1 out of 4).

- empty

Note: All possible 2 by 2 matrices containing Region II rack cells shall comply with at least one of the following: (1) within the "acceptable" domain of Figure 3.7.17-1 in a 4 out of 4 configuration, (2) within the "acceptable" domain of Figure 3.7.17-2 in a 3 out of 4 configuration, (3) within the "acceptable" domain of Figure 3.7.17-3 in a 2 out of 4 configuration, or (4) a 1 out of 4 configuration.

Region I and Region II interface restrictions: The Region II 1 out of 4 configuration shall be oriented such that the single fuel assembly resides in the internal row with the empty cells facing Region I. There are no interface restrictions between the Region II (2/4, 3/4, 4/4) and Region I configurations.

Figure 3.7.17-4 (page 1 of 1)
Storage Configurations (4/4, 3/4, 2/4, 1/4) in Region II Racks

5.5 Programs and Manuals (continued)

5.5.21 Surveillance Frequency Control Program

This program provides controls for Surveillance Frequencies. The program shall ensure that Surveillance Requirements specified in the Technical Specifications are performed at intervals sufficient to assure the associated Limiting Conditions for Operation are met.

a. The Surveillance Frequency Control Program shall contain a list of Frequencies of those Surveillance Requirements for which the Frequency is controlled by the program.

b. Changes to the Frequencies listed in the Surveillance Frequency Control Program shall be made in accordance with NEI-04-10, "Risk-Informed Method for Control of Surveillance Frequencies," Revision 1.

c. The provisions of Surveillance Requirements 3.0.2 and 3.0.3 are applicable to the Frequencies established in the Surveillance Frequency Control Program.

5.5.22 Spent Fuel Assembly Dispersion Program

Administrative controls are used to maintain a less reactive configuration in the spent fuel pool Region II storage racks than is allowed by TS 3.7.17. This program prevents storing several "low margin" fuel assemblies (fuel with relatively low values of excess reactivity margin) in the same area within the storage racks, and therefore makes it necessary to disperse the low margin fuel within fuel assemblies with higher levels of reactivity margin.

a. Prior to changing the configuration of fuel within the Region II storage racks, the minimum calculated value of Average Excess Margin is compared to an established baseline.

b. A value of excess margin provides a relative measure of margin beyond the spent fuel pool criticality analysis, and is determined for each fuel assembly to be stored in Region II. The excess margin is based on the following values:

1. The Excess Margin due to Excess Fuel Burnup is calculated as follows:

   - Excess Burnup = [actual burnup (MWD/MTU)] – [minimum value required for storage in the assembly's Maximum Allowable Storage Configuration per TS 3.7.17 (MWD/MTU)]

   - Excess Margin = [Excess Burnup] x 323 pcm / 1,000 MWD/MTU

2. The Excess Margin due to Decay Time is calculated as follows:

5.5 Programs and Manuals

- Excess Margin = 112 pcm x [decay time in years], for decay time < 20 years

- Excess Margin = 2240 pcm, for decay time ≥ 20 years

c. No two assemblies with an Excess Margin value < 1000 pcm will be stored adjacent to each other (including diagonally). In this case, the fuel move plans are altered to place the low margin assemblies further apart.

d. A value of Average Excess Margin is determined for each fuel assembly by averaging the sum of the applicable margins for all adjacent fuel assemblies.

- For each assembly, the Average Excess Margin is the average values of Excess Margin for all assemblies stored in a 3x3 array, centered on the fuel assembly.

- This step is intended to identify areas in the SFP where multiple assemblies with low excess margin are stored in close proximity, and therefore does not apply for fuel stored in a "1 out of 4" configuration.

e. If the minimum value of Average Excess Margin in the Region II storage racks is determined to be < 2000 pcm, then the fuel move plans are altered to provide additional excess margin.

ATTACHMENT 5 to TXX-13001

RETYPED TECHNICAL SPECIFICATION BASES PAGES
(For Information Only)

Pages	B 3.7-72
	B 3.7-73
	B 3.7-74
	B 3.7-75
	B 3.7-76
	B 3.7-77
	B 3.7-78
	B 3.7-79
	B 3.7-80

B 3.7 PLANT SYSTEMS

B 3.7.16 Fuel Storage Pool Boron Concentration

BASES

BACKGROUND

A common Fuel Building houses facilities for storage and transfer of new and spent fuel. Two pools are provided for CPSES spent fuel storage. Each pool may be used to store fuel from either or both of the CPSES units.

In the Region II rack (References 1 and 2) design, the spent fuel storage pool numbers 1 and 2 (SFP1 and SFP2) permit four different configurations (as shown in Figure 3.7.17-4) which, for the purpose of criticality considerations, are considered as separate pools. Region II racks, with 1462 and 1470 storage positions in SFP1 and SFP2 respectively (2932 total), are designed to accommodate fuel of various initial enrichments which have accumulated minimum burnups and power history within either (1) the "acceptable" domain of Figure 3.7.17-1 in a 4 out of 4 configuration, (2) the "acceptable" domain of Figure 3.7.17-2 in a 3 out of 4 configuration, (3) the "acceptable" domain of Figure 3.7.17-3 in a 2 out of 4 configuration, or (4) a 1 out of 4 configuration as shown in Figure 3.7.17-4.

Region I racks (References 1 and 2) with 222 and 219 storage positions located in SFP1 and SFP2 respectively (441 total), constitute a fifth configuration within the pools. These Region I racks are designed to accommodate new fuel with a maximum enrichment of 5.0 w/t % U-235 or spent fuel regardless of the discharge fuel burnup or power history. Soluble boron is not credited for the storage of spent fuel assemblies within the Region I racks, and there are no storage pattern restrictions associated with the Region I racks. The neutron absorber material Boral is credited for the storage of spent fuel assemblies within the Region I racks to maintain k_{eff} less than or equal to 0.95.

Soluble boron is not credited for the storage of fuel assemblies within the Region II racks in the 1 out of 4 and 2 out of 4 configurations. Criticality analyses have been performed (Reference 2) which demonstrate that the multiplication factor, k_{eff}, of the fuel and spent fuel storage racks is less than or equal to 0.95.

In order to maintain k_{eff} less than or equal to 0.95, the presence of fuel pool soluble boron is credited for the storage of fuel assemblies within the Region II racks in the 3 out of 4 and 4 out of 4 configurations. A description of how credit for fuel storage pool soluble boron is used under normal storage configuration conditions is found in References 2, 3, and 4. The storage configuration is defined using calculations to ensure that k_{eff} will be less than 1.0 with no soluble boron under normal storage conditions including

(continued)

BASES

BACKGROUND (continued)

tolerances and uncertainties. Soluble boron credit is then used to maintain k_{eff} less than or equal to 0.95. Criticality analyses have been performed (Reference 3) which demonstrate that the pools require 800 ppm of soluble boron to maintain k_{eff} less than or equal to 0.95 for all allowed combinations of storage configurations, enrichments, burnups, and power history limits. The effect of B-10 depletion on the boron concentration for maintaining k_{eff} less than or equal to 0.95 is negligible.

Criticality analyses considering accident conditions have also been performed (References 2 and 3). These analyses establish the amount of soluble boron necessary to ensure that k_{eff} will be maintained less than or equal to 0.95 should pool temperatures fall outside the assumed range or a fuel assembly misload occur. The total amount of soluble boron required to mitigate these events is 1900 ppm.

For an occurrence of the above postulated accident condition, the double contingency principle of ANSI/ANS 8.1-1983 (Reference 6) can be applied. This states that one is not required to assume two unlikely, independent, concurrent events to ensure protection against a criticality accident. Thus, for these postulated accident conditions, the presence of additional soluble boron in the storage pool water (above the concentration required for normal conditions and reactivity equivalencing) can be assumed as a realistic initial condition since not assuming its presence would be a second unlikely event.

A boron concentration equal to or greater than 2000 ppm assures that a dilution event which will result in a k_{eff} greater than 0.95 is not credible. This is demonstrated by a boron dilution analysis performed for the CPSES Spent Fuel pools. A boron concentration of ≥ 2400 ppm provides additional excess margin for the boron dilution analysis. This conclusion is based on the following: (1) a substantial amount of water is needed in order to dilute the SFP to the design k_{eff} of 0.95, (2) since such a large water volume turnover is required, a SFP dilution event would be readily detected by plant personnel via alarms, flooding in the fuel and auxiliary buildings or by normal operator rounds through the SFP area, and (3) evaluations indicate that, based on the flow rates of non-borated water normally available to the SFP, taken in conjunction with significant operator errors, and equipment failures, sufficient time is available to detect and respond to a dilution event. In addition, there is significant conservatism built into this evaluation; for example, the cooling of the spent fuel pools can be performed by one train supplying common water to both pools. This cooling configuration would allow credit of the volume of both pools and substantially increase the dilution time estimates presented. However, because the flexibility exists for

(continued)

BASES

BACKGROUND (continued)

the cooling system to be totally dedicated to one pool, only one pool volume is considered in this evaluation.

It should be noted that this boron dilution evaluation considered the boron dilution volumes required to dilute the SFP from 1900 ppm to 800 ppm. The 800 ppm end point was utilized to ensure that k_{eff} for the spent fuel racks would remain less than or equal to 0.95. However, as discussed above, calculations for Region II 3 out of 4 and 4 out of 4 configurations have been performed on a 95/95 basis to show that the spent fuel rack k_{eff} remains less than 1.0 with non-borated water in the pool. Thus, even if the SFP were diluted to concentrations approaching zero ppm, the fuel in the Region II racks would remain subcritical and the health and safety of the public would be protected.

The storage of fuel with initial enrichments up to and including 5.0 weight percent U-235 in the Comanche Peak fuel storage pools has been evaluated. For the Region II storage racks, the resulting enrichment, burnup, and power history limits for the pool are shown in Figures 3.7.17-1 through 3.7.17-4.

APPLICABLE SAFETY ANALYSES

Most fuel storage pool accident conditions will not result in a significant increase in k_{eff}. Examples of such accidents are the drop of a fuel assembly on top of a rack, and the drop of a fuel assembly outside but adjacent to the rack modules.

A dropped assembly accident occurs when a fuel assembly is dropped onto the storage racks. The rack structure is not excessively deformed. An assembly, in its most reactive condition, is considered in the criticality evaluation. Accident analyses have been performed which demonstrate that the dropped assembly which comes to rest horizontally on top of the rack has sufficient water separating it from the active fuel height of stored assemblies to preclude neutronic interaction. This is true even with unborated water. For the borated water condition, the potential for interaction is even less since the water contains boron which is an additional thermal neutron absorber.

However, three accidents can be postulated for each storage configuration that could increase reactivity beyond the analyzed condition. The first postulated accident would be a change in pool temperature to outside the range of normal operating temperatures assumed in the criticality analyses (50°F to 150°F). The second accident would be dropping a fuel assembly into an already loaded cell. The third would be the misloading of a fuel

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

assembly within the racks into a cell for which the restrictions on location, enrichment, burnup, or power history are not satisfied or adjacent to but outside the racks.

Variations in the temperature of the water passing through the stored fuel assemblies outside the normal operating range were considered in the criticality analysis. The reactivity effects of a temperature range from 32°F to 212°F were evaluated. The increase in reactivity due to the change in temperature is bounded by the misloading accident.

For the accident of dropping a fuel assembly into an already loaded cell, the upward axial leakage of that cell will be reduced; however, the overall effect on the rack reactivity will be insignificant. This is because minimizing the upward-only leakage of just a single cell will not cause any significant increase in reactivity. Furthermore, the neutronic coupling between the dropped assembly and the already loaded assembly will be low due to several inches of assembly nozzle structure which would separate the active fuel regions. Therefore, this accident would clearly be bounded by the misloading accident.

The fuel assembly misloading accident involves placement of a fuel assembly in a location for which it does not meet the requirements for enrichment, burnup, or power history including the placement of an assembly in a location that is required to be left empty. The result of the misloading is to add positive reactivity, increasing k_{eff} toward 0.95. The maximum required boron to compensate for this event is 1900 ppm, which is below the LCO limit of 2400 ppm.

The concentration of dissolved boron in the fuel storage pool satisfies Criterion 2 of the 10CFR50.36(c)(2)(ii).

LCO

The fuel storage pool boron concentration is required to be ≥ 2400 ppm. The specified concentration of dissolved boron in the fuel storage pool preserves the assumptions used in the analyses of the potential criticality accident scenarios as described in Reference 5. The amount of soluble boron required to offset each of the above postulated accidents was evaluated for all of the proposed storage configurations. A boron concentration of 2000 ppm assures that the concentration will remain above these values. A specified boron concentration of ≥ 2400 ppm in the LCO provides excess margin above 2000 ppm boron concentration.

APPLICABILITY

This LCO applies whenever fuel assemblies are stored in the spent fuel storage pool.

(continued)

BASES (continued)

ACTIONS

A.1 and A.2

When the concentration of boron in the fuel storage pool is less than required, immediate action must be taken to preclude the occurrence of an accident or to mitigate the consequences of an accident in progress. This action is most efficiently achieved by immediately suspending the movement of fuel assemblies. The concentration of boron is restored simultaneously with suspending movement of fuel assemblies. Prior to resuming movement of fuel assemblies, the concentration of boron must be restored. This requirement does not preclude movement of a fuel assembly to a safe position.

The Required Actions are modified by a Note indicating that LCO 3.0.3 does not apply. If the LCO is not met while moving irradiated fuel assemblies in MODE 5 or 6, LCO 3.0.3 would not be applicable. 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.

SURVEILLANCE REQUIREMENTS

SR 3.7.16.1

This SR verifies that the concentration of boron in the fuel storage pool is within the required limit. As long as this SR is met, the analyzed accidents are fully addressed. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. FSAR, Section 9.1.
2. License Amendment Requests 94-22, 98-08, and 00-05, Spent Fuel Storage Capacity Increase, Docket NOS 50-445 and 50-446, CPSES.
3. Comanche Peak High Density Spent Fuel Rack Criticality Analysis using Soluble Boron Credit and No Outer Wrapper Plate, dated July, 2001 (Enclosure 2 to TXX-01118).
4. WCAP-14416 NP-A, Rev. 1, "Westinghouse Spent Fuel Rack Criticality Analysis Methodology," November 1996.
5. FSAR, Section 15.7.4.
6. American Nuclear Society, "American National Standard for Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors," ANSI/ANS-8.1-1983, October 7, 1983.

B 3.7 PLANT SYSTEMS

B 3.7.17 Spent Fuel Assembly Storage

BASES

BACKGROUND

A common Fuel Building houses facilities for storage and transfer of new and spent fuel. Two pools are provided for CPSES spent fuel storage. Each pool may be used to store fuel from either or both of the CPSES units.

In the Region II rack (References 1 and 2) design, the spent fuel storage pool numbers 1 and 2 (SFP1 and SFP2) permit four different configurations (as shown in Figure 3.7.17-4) which, for the purpose of criticality considerations, are considered as separate pools. Region II racks, with 1462 and 1470 storage positions in SFP1 and SFP2 respectively (2932 total), are designed to accommodate fuel of various initial enrichments which have accumulated minimum burnups and power history within either (1) the "acceptable" domain of Figure 3.7.17-1 in a 4 out of 4 configuration, (2) the "acceptable" domain of Figure 3.7.17-2 in a 3 out of 4 configuration, (3) the "acceptable" domain of Figure 3.7.17-3 in a 2 out of 4 configuration, or (4) a 1 out of 4 configuration as shown in Figure 3.7.17.4.

The "Power History" requirements associated with Figure 3.7.17-1, Figure 3.7.17-2, and Figure 3.7.17-3 refer to the highest value of Rated Thermal Power for any fuel cycle which contained the assembly. Figure 3.7.17-1 only contains a limit associated with a Power History ≤ 3458 MWt. This limits fuel assemblies which have been depleted in a fuel cycle with a Rated Thermal Power higher than 3458 MWt to a less dense storage configuration. Figure 3.7.17-3 only contains a burnup limit curve associated with a Power History ≤ 3458 MWt, but includes a note explaining that fuel with Power History ≤ 3612 MWt may be stored in "2 out of 4" if the limits of Figure 3.7.17-2 are satisfied. Therefore, fuel which has been depleted with a Rated Thermal Power higher than 3458 MWt must satisfy the limitations for "3 out of 4" storage to be stored in either a "2 out of 4" or "3 out of 4" configuration.

Region I racks (References 1 and 2) with 222 and 219 storage positions located in SFP1 and SFP2 respectively (441 total) constitute a fifth configuration within the pools. These Region I racks are designed to accommodate new fuel with a maximum enrichment of 5.0 w/t % U-235 or spent fuel regardless of the discharge fuel burnup. Soluble boron is not credited for the storage of spent fuel assemblies within the Region I racks, and there are no storage pattern restrictions associated with the Region I racks. The neutron absorber material Boral is credited for the storage of spent fuel assemblies within the Region I racks to maintain k_{eff} less than or equal to 0.95.

(continued)

BASES

BACKGROUND (continued)

A discussion of how soluble boron is credited for the storage of spent fuel assemblies is contained in the BACKGROUND for B 3.7.16.

Within the SFP1 Region II racks, there exist two oversized (2x2) cells. Within the SFP2 Region I racks, there exists one oversized (2x2) cell. These oversized cells are not approved for storage of either fresh or spent fuel. However, they can be used as a place in the pool for an assembly to be lowered and raised while being inspected. Prior to use of the inspection cells certain prerequisites must be met. Criticality analyses (Reference 3) have been performed which demonstrate that there is no increase in reactivity relative to the approved Region II storage configurations (the current licensing basis requirements for the spent fuel pool are still met) provided that administrative prerequisites are maintained for the oversized cells in SFP1 Region II racks. The prerequisite for the use of the oversized cells in Region II racks is that all the Region II cells in the first row surrounding the oversized cell remain empty. This results in a total of 8 empty Region II cells adjacent to the oversized cell in the SFP I Region II rack adjacent to the Region I rack and a total of 5 empty Region II cells adjacent to the oversized cell in the SFP1 Region II racks adjacent to the spent fuel pool walls. There are no prerequisites for the use of the oversized cell in SFP2 Region I racks since the criticality analyses (Reference 3) demonstrate there is no increase in reactivity relative to the approved Region I storage configuration.

APPLICABLE SAFETY ANALYSES

A discussion of the criticality analysis for the storage of spent fuel assemblies is contained in the APPLICABLE SAFETY ANALYSES for B 3.7.16.

Most fuel storage pool accident conditions will not result in a significant increase in k_{eff}. Examples of such accidents are the drop of a fuel assembly on top of a rack, and the drop of a fuel assembly outside but adjacent to the rack modules. However, accidents can be postulated for each rack storage configuration which could increase reactivity beyond the analyzed condition. A discussion of these accidents is contained in B 3.7.16.

By closely controlling the movement of each assembly and by checking the location of each assembly after movement, the time period for potential accidents may be limited to a small fraction of the total operating time.

The configuration of fuel assemblies in the fuel storage pool satisfies Criterion 2 of 10CFR50.36(c)(2)(ii).

LCO

The restrictions on the placement of fuel assemblies within the spent fuel

(continued)

BASES

LCO (continued)

pool, in accordance with Figures 3.7.17-1 through 3.7.17-4, in the accompanying LCO, ensures the k_{eff} of the spent fuel storage pool will always remain ≤ 0.95, assuming the pool to be flooded with borated water.

NOTE: The oversized inspection cells within the racks are not approved storage locations and are not covered by the LCO. Administrative controls which govern the use of the inspections cells are described in the BACKGROUND.

APPLICABILITY

This LCO applies whenever any fuel assembly is stored in Region II racks of the fuel storage pool. Figures 3.7.17-1 through 3.7.17-3 contain a limitation on Power History, which refers to the highest value of Rated Thermal Power for any fuel cycle which the fuel assembly was depleted in. A fuel assembly has a Power History of 3612 MWt if it was included in Unit 1 Cycle 14, Unit 2 Cycle 12, or any more recent fuel cycle.

Region II storage is only applicable for fuel assemblies discharged from Unit 1 Cycle 16, Unit 2 Cycle 14 and prior operating cycles for Units 1 and 2.

ACTIONS

A.1

When the configuration of fuel assemblies stored in Region II racks of the spent fuel storage pool is not in accordance with Figures 3.7.17-1 through 3.7.17-4, the immediate action is to initiate action to make the necessary fuel assembly movement(s) to bring the configuration into compliance with Figures 3.7.17-1 through12 3.7.17-4.

Required Action A.1 is modified by a Note indicating that LCO 3.0.3 does not apply. If unable to move irradiated fuel assemblies while in MODE 5 or 6, LCO 3.0.3 would not be applicable. If unable to move irradiated fuel assemblies while in MODE 1, 2, 3, or 4, the action is independent of reactor operation. Therefore, inability to move fuel assemblies is not sufficient reason to require a reactor shutdown.

SURVEILLANCE REQUIREMENTS

SR 3.7.17.1

This SR verifies, by administrative means, that the initial enrichment, burnup and power history of the fuel assembly is in accordance with Figures 3.7.17-1 through 3.7.17-4 in the accompanying LCO.

(continued)

BASES (continued)

REFERENCES

1. FSAR Section 9.1.
2. License Amendment Request 94-22, 98-08, and 00-05 Spent Fuel Storage Capacity Increase, Docket Nos. 50-445 and 50-446, CPSES.
3. Criticality Safety Analysis of Holtec Spent Fuel Racks, dated January, 2003 (Holtec Report HI-2002436, Revision 9).

ENCLOSURE 2 to TXX-13001

Comanche Peak Nuclear Power Plant Units 1 & 2 Interim Uprate Criticality Safety Analysis (Non-Proprietary)

Comanche Peak Nuclear Power Plant Units 1 & 2 Interim Uprate Criticality Safety Analysis: Non-Proprietary Version

(12 pages)

Table of Contents

1 Introduction

This analysis is performed to develop new burnup vs. enrichment requirements (burnup requirements) for storage of fuel which has been operated in either Unit 1 or Unit 2 of the Comanche Peak Nuclear Power Plant (CPNPP) at up to the current licensed power level of 3612 Megawatts-thermal (MWt). The analysis develops the burnup requirements for storage of fuel in the Spent Fuel Pool (SFP) in a "3 out of 4" (3oo4) configuration as described in Section 2 below. This analysis is an expansion, rather than a replacement, of the analysis described in References 1 and Reference 2 and approved in Reference 3.

The CPNPP licensed power level at the time the NRC approval was received in Reference 3 was 3411 MWt and the analysis described in References 1 and 2 was performed at a power level of 3565 MWt for conservatism. The burnup requirements described here are based on the methodology described in Reference 1.

The methods used to approximate the amount of reactivity margin an assembly has to its storage limit are included in Section 3. The reactivity margin calculated is impacted by the presence/absence of Reactivity Control Cluster Assemblies (RCCAs), the theoretical density of fuel compared to the assumptions used in the analysis, the time an assembly has been stored in Region II of the CPNPP SFPs, and the burnup in excess of the burnup requirements for the SFPs.

2 Methodology for Burnup vs. Enrichment Requirement Generation

The methodology used to develop these burnup requirements is based on that used in Reference 1. This methodology is the current Analysis of Record which was approved on October 2nd, 2001 (Reference 3). A brief outline of the methods used is provided in this section.

2.1 Codes

The analysis was performed using the same code set that was used in References 1 and 2. NITWAL-II (Reference 4) and XSDRNPM-S (Reference 5) are used for cross-section generation and the Monte-Carlo code KENO V.a (KENO) (Reference 6) is used for reactivity calculations. Westinghouse Lattice-Physics code PHOENIX-P is used for burnup equivalencing and tolerance calculations.

2.2 Depletion Parameters

2.2.1 Core Operation Parameters

To develop the burnup requirements presented in Section 2.4 core operation parameters need to be selected. The core operation parameters used in the depletion calculations are shown in Table 2.2-1 and discussed below.

Table 2.2-1: Core Operating Parameters

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[ ]

2.2.1.1 Fuel Density

Fuel density impacts the amount of fissile material in a fuel rod. Therefore, a higher fuel density is conservative. [

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2.2.1.2 Core Power

Core power, and therefore assembly power, is an input which impacts both the specific power (Watts/gram) and fuel temperatures used in the analysis. The licensed operating power of 3612 MWt was assumed throughout depletion. [

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2.2.1.3 Moderator Flow Rate

The moderator flow rate impacts the fuel temperatures in the isotopic calculation, with lower flow rate being more conservative as it leads to higher temperatures. [

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2.2.1.4 Soluble Boron Concentration

The soluble boron concentration impacts the neutron spectrum seen by the fuel as it is being depleted.
[

]a,c

2.2.2 Axial Burnup and Moderator Temperature Profiles

The axial burnup and moderator temperature profiles play an important role in developing appropriate storage requirements for fuel stored in the SFP. The methodology in References 1 and 2 is based on two dimensional (2D) calculations. Inherent in a 2D treatment, a uniform axial burnup distribution was assumed. This is addressed in the following section.

2.2.2.1 Axial Burnup Profile

[

]a,c For the 3oo4 configuration documented here, the axial burnup bias is calculated to be worth 0.02219 Δk.

2.2.2.2 Axial Moderator Temperature Profile

With the use of a 2D methodology a uniform moderator temperature profile is assumed. [

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2.3 Bias and Uncertainty Calculations

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[

]a,c

2.3.1 Biases

This section discusses the biases which are applied to the 3oo4 configuration documented here. Reactivity biases are known variations between the real and analyzed system. Their reactivity impact is added directly to the calculated k_{eff}. Temperature and methodology biases must be considered in the final k_{eff} summation prior to comparing against the regulatory limit of $k_{eff} < 1.0$.

2.3.1.1.1 Methodology Bias

The benchmarking bias as determined for the Westinghouse KENO methodology is considered. The methodology used to support this validation bias value is supported by Reference 1.

2.3.1.1.2 Water Temperature

A reactivity bias is applied to account for the effect of the normal range of spent fuel pool water temperatures (50°F to 150°F).

2.3.2 Reactivity Credits & Penalties

2.3.2.1 Reactivity Penalties

As described in Section 2.2.2.1, a conservative reactivity penalty accounting for the axial burnup distribution of fuel assemblies was developed to ensure that the SFP remained safe and subcritical even under unborated conditions. [

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In addition to the axial burnup bias penalty, two additional biases/penalties are applied to the development of the uprate burnup limits for the 3oo4 storage configuration documented here.

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2. [
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2.3.2.2 Reactivity Credits

To mitigate the impact of increasing the axial burnup bias, in 2001 Westinghouse identified certain excess conservatisms in the methodology of References 1 and 2. The excess conservatisms applicable to this plant specific analysis which are used to offset the revised axial burnup bias term include:

1. In the KENO model, the spent fuel pool is modeled with an infinitely repeating array of individual storage cells. This assumption conservatively neglects leakage into the gaps between storage rack modules, which for CPNPP are a minimum of 1.25 inches. The reactivity effect of leakage between storage racks was determined with a KENO calculation in which the gaps were explicitly modeled.

2. In the methodology described in Reference s 1 and 2, no credit is taken for the buildup or decay of Samarium and fission products after discharge. Calculations were performed to conservatively determine the reactivity effect of samarium and fission products at 100 hrs after shutdown, which is the cooling time associated with peak reactivity.

3. Fuel assembly depletion calculations are performed with a conservatively high constant value of soluble boron (a value of 1500 ppm is used). In actual uprate operation, the soluble boron varies from about 1200 ppm at the beginning-of-cycle to near zero at the end-of-cycle (a maximum concentration of approximately 1400 ppm occurs at the peak of the IFBA 'hump'). A lower cycle average boron value results in a softer neutron spectrum and makes the fuel assemblies less reactive with burnup due to the reduced plutonium. To determine the reactivity effect of the overly conservative soluble boron assumption, a calculation was performed with a more realistic but still bounding boron letdown curve.

4. Credit can be taken for existing margin to the k_{eff} limit. The existing margin to the k_{eff} limit is the difference between the regulatory limit of $k_{eff} < 1.0$ (for soluble boron credit) and the calculated value of k_{eff}, from Reference 2 for the 3-out-of-4 configurations, determined on a 95/95 basis. Note that this credit is because 0.00500 Δk of administrative margin is being applied to the analysis as a reactivity penalty.

5. In the methodology described in Section 3.2, the uncertainty allowance for the standard DOE tolerance for enrichment is determined by considering a 0.05 wt% ^{235}U variation about the allowable enrichment for fresh fuel with no burnup. The allowable initial enrichment for the 3oo4 configuration is 1.51 wt%. The reactivity uncertainty allowance for the enrichment tolerance for high burnup fuel at a higher enrichment of up to 5.0 w/o ^{235}U, in the range where the axial burnup bias issue applies, is significantly lower than that for low enriched fresh fuel.

2.3.3 Tolerances

For the Comanche Peak spent fuel rack High Density storage configurations, [

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1. [

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Table 2.3-1: Bias, Credit & Uncertainty Rackup

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2.4 Burnup Requirements

The burnup vs. enrichment requirements in Table 2.4-1 provide storage requirements for any fuel operated at Comanche Peak at any core average power up to 3612 MWt. These limits represent storage of fuel in a 3oo4 configuration and do not credit decay time. Note that for initial enrichments below 2.0 wt% ^{235}U, the burnup requirements for 2.0 wt% are used.

Table 2.4-1: Burnup Limit for 3oo4 configuration with 100 hours decay	
Initial Enrichment (wt%)	Burnup (MWd/MTU)
1.51	9847
1.60	9847
1.80	9847
2.00	9847
2.20	12540
2.40	15165
2.60	17760
2.80	20388
3.00	22928
3.20	25379
3.40	27753
3.60	30064
3.80	32324
4.00	34550
4.20	36752
4.40	38928
4.60	41073
4.80	43183
4.95	44739
5.00	45253

2.5 Soluble Boron Requirements

The total soluble boron required without accidents and the total soluble boron required with accidents from the current AOR is confirmed to still be applicable to the uprate analysis of the 3oo4 storage configuration. The target keff of the uprate 3oo4 storage configuration is lower than the target keff of the pre-uprate 3oo4 configuration. Therefore the reactivity of assemblies stored under the uprate storage requirements are less reactive than assumed when determining the soluble boron requirements for the AOR. Therefore no changes to the soluble boron requirements need to be made to continue to meet the regulatory requirement that $k_{eff} \leq 0.95$ under borated conditions due to the uprate.

3 Excess Reactivity Evaluation

In performing a SFP criticality analysis, it is assumed that all fuel stored in the pool is stored in the most reactive configuration possible. It is assumed that all assemblies are stored at exactly the burnup limit and configuration as analyzed. However, actual fuel stored in the SFP may be of a lower reactivity than assumed in the analysis due to the presence of additional conservatisms.

This section discusses the quantification of some of these to use in evaluating the actual reactivity margin in the SFP. Understanding the reactivity margin of the assemblies stored in the SFP allows for identification of those assemblies which have little margin beyond that needed to meet the regulatory requirement of $k_{eff} < 1.0$.

Additionally, this section discusses the appropriate way to review assemblies for the approximate reactivity margin associated with a subset of the area in the SFP.

3.1 RCCA Worth

RCCAs that are discharged from the core after they have met their design lifetime are stored in fuel assemblies in the SFP. The discharged RCCAs significantly reduce the reactivity of the assembly that they are stored in, as well as the surrounding assemblies. [

]^{a,c}

3.2 Depletion Worth

Assemblies stored in the SFP must be stored at or above the burnup requirements developed in the SFP criticality safety analysis. Thus each assembly has some amount of burnup in excess of the burnup required to be stored. Because of this excess burnup, each assembly is less reactive than assumed in the analysis. [

]^{a,c}

3.3 Decay Credit Worth

The burnup requirements for fuel stored in the CPNPP SFP are based on the assumption that all fuel was discharged from the reactor 100 hours ago. There is no credit taken for the decay of actinides or fission products. Because the actual fuel stored in the SFPs has been discharged for varying lengths of time from hours to decades, the actual fuel reactivity compared to the as-analyzed fuel reactivity varies significantly.

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3.4 Theoretical Density Worth

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3.5 Reactivity 'Averaging'

While determining the reactivity margin of an assembly, it is important to consider the area surrounding the assembly. An assembly surrounded by other assemblies that are closer to the burnup requirement would be more reactive than an assembly surrounded by assemblies that are farther from the burnup requirement. Therefore, when determining the excess margin of an assembly (or average margin for an area of the pool), it is prudent to include the assembly in question as well as all adjacent (both face and corner) assemblies; essentially this means viewing each assembly as the center of a 3 x 3 configuration.

4 References

1. Letter from C. L. Terry, TXU Electric, to U.S. NRC, Subject: "Comanche Peak Steam Electric Station (CPSES) – Docket Nos. 50-445 and 50-446 – License Amendment Request (LAR) 00-05 – Revision to Technical Specification Spent Fuel Assembly Storage Racks and Fuel Storage Capacity," Accession #: ML003760128, October 4, 2000.
2. Letter from C. L. Terry, TXU Electric, to U.S. NRC, Subject: "Comanche Peak Steam Electric Station (CPSES) – Docket Nos. 50-445 and 50-446 – Supplement Three to License Amendment Request (LAR) 00-05: Revision to Technical Specification Spent Fuel Assembly Storage Racks and Fuel Storage Capacity (TAC Nos. MB0207 and MB0208)," Accession #: ML012040507, July 18, 2001.
3. Letter from David H. Jaffe to C. L. Terry, TXU Electric, Subject: "Comanche Peak Steam Electric Station (CPSES), Units 1 AND 2 – Issuance of amendments Re: Increase in Spent Fuel Storage Capacity to 373 Fuel Assemblies (TAC NOS. MB0207 AND MB0208)", October 2, 2001. ADAMS Accession #: ML012560143
4. Greene, N. M., "NITAWL-II: SCALE System Module for Performing Resonance Shielding and Working Library Production," NUREG/CR-0200, Vol. 2, Section F2, June 1989.
5. Greene, N. M., "XSDRNPM-S: A One-Dimensional Discrete-Ordinates Code for Transport Analysis," NUREG/CR-0200, Vol. 2, Section F3, June 1989.
6. Petrie, L.M. and Landers, N. F., "KENO Va- An Improved Monte Carlo Criticality Program With Supergrouping," NUREG/CR-0200, Vol. 2, Section F11, November 1993.
7. DSS-ISG-2010-1, "Staff Guidance Regarding the Nuclear Criticality Safety Analysis for Spent Fuel Pools," Accession #: ML102220567.

ENCLOSURE 3 to TXX-13001

Westinghouse Application for Withholding Proprietary Information From Public Disclosure CAW-12-3577, accompanying Affidavit, Proprietary Information Notice, and Copyright Notice

Westinghouse

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CAW-12-3577

December 13, 2012

APPLICATION FOR WITHHOLDING PROPRIETARY
INFORMATION FROM PUBLIC DISCLOSURE

Subject: Comanche Peak Nuclear Power Plant Units 1 & 2 Interim Uprate Criticality Safety Analysis (Proprietary)

The proprietary information for which withholding is being requested in the above-referenced report is further identified in Affidavit CAW-12-3577 signed by the owner of the proprietary information, Westinghouse Electric Company LLC. The affidavit, which accompanies this letter, sets forth the basis on which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of 10 CFR Section 2.390 of the Commission's regulations.

Accordingly, this letter authorizes the utilization of the accompanying affidavit by Luminant Generation Co. LLC.

Correspondence with respect to the proprietary aspects of the application for withholding or the Westinghouse affidavit should reference CAW-12-3577, and should be addressed to James A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company, Suite 428, 1000 Westinghouse Drive, Cranberry Township, Pennsylvania 16066.

Very truly yours,

JaGresham

James A. Gresham, Manager
Regulatory Compliance

Enclosures

CAW-12-3577

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

ss

COUNTY OF BUTLER:

Before me, the undersigned authority, personally appeared James A. Gresham, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Company LLC (Westinghouse), and that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information, and belief:

James A. Gresham, Manager
Regulatory Compliance

Sworn to and subscribed before me
this 13th day of December 2012

Elaine M. DiGirolamo
Notary Public

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Elaine M. DiGirolamo, Notary Public
Harrison Twp., Allegheny County
My Commission Expires Dec. 16, 2013
Member, Pennsylvania Association of Notaries

(1) I am Manager, Regulatory Compliance, in Nuclear Services, Westinghouse Electric Company LLC (Westinghouse), and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing and rule making proceedings, and am authorized to apply for its withholding on behalf of Westinghouse.

(2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.390 of the Commission's regulations and in conjunction with the Westinghouse Application for Withholding Proprietary Information from Public Disclosure accompanying this Affidavit.

(3) I have personal knowledge of the criteria and procedures utilized by Westinghouse in designating information as a trade secret, privileged or as confidential commercial or financial information.

(4) Pursuant to the provisions of paragraph (b)(4) of Section 2.390 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.

(i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse.

(ii) The information is of a type customarily held in confidence by Westinghouse and not customarily disclosed to the public. Westinghouse has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. The application of that system and the substance of that system constitutes Westinghouse policy and provides the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

(a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.

(b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage, e.g., by optimization or improved marketability.

(c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.

(d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.

(e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.

(f) It contains patentable ideas, for which patent protection may be desirable.

There are sound policy reasons behind the Westinghouse system which include the following:

(a) The use of such information by Westinghouse gives Westinghouse a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the Westinghouse competitive position.

(b) It is information that is marketable in many ways. The extent to which such information is available to competitors diminishes the Westinghouse ability to sell products and services involving the use of the information.

(c) Use by our competitor would put Westinghouse at a competitive disadvantage by reducing his expenditure of resources at our expense.

(d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component may be the key to the entire puzzle, thereby depriving Westinghouse of a competitive advantage.

(e) Unrestricted disclosure would jeopardize the position of prominence of Westinghouse in the world market, and thereby give a market advantage to the competition of those countries.

(f) The Westinghouse capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.

(iii) The information is being transmitted to the Commission in confidence and, under the provisions of 10 CFR Section 2.390, it is to be received in confidence by the Commission.

(iv) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.

(v) The proprietary information sought to be withheld in this submittal is that which is appropriately marked in "Comanche Peak Nuclear Power Plant Units 1 & 2 Interim Uprate Criticality Safety Analysis" (Proprietary), for submittal to the Commission, being transmitted by Luminant Generation Co. LLC letter and Application for Withholding Proprietary Information from Public Disclosure, to the Document Control Desk. The proprietary information as submitted by Westinghouse is that associated with Luminanat's request for request for NRC approval of "Comanche Peak Nuclear Power Plant Units 1 & 2 Interim Uprate Criticality Safety Analysis," and may be used only for that purpose.

This information is part of that which will enable Westinghouse to:

(a) Provide results of customer specific calculations.

(b) Provide licensing support for customer submittals.

Further this information has substantial commercial value as follows:

(a) Westinghouse plans to sell the use of the information to its customers for the purpose of meeting NRC requirements for licensing documentation associated with Spent Fuel Criticality submittals supporting SPU.

(a) Westinghouse can sell support and defense of the use of the technology to its customer in licensing process.

(b) The information requested to be withheld reveals the distinguishing aspects of a methodology which was developed by Westinghouse.

Public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to provide similar technical evaluation justifications and licensing defense services for commercial power reactors without commensurate expenses. Also, public disclosure of the information would enable others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

The development of the technology described in part by the information is the result of applying the results of many years of experience in an intensive Westinghouse effort and the expenditure of a considerable sum of money.

In order for competitors of Westinghouse to duplicate this information, similar technical programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended.

Further the deponent sayeth not.

PROPRIETARY INFORMATION NOTICE

Transmitted herewith are proprietary and/or non-proprietary versions of documents furnished to the NRC in connection with requests for generic and/or plant-specific review and approval.

In order to conform to the requirements of 10 CFR 2.390 of the Commission's regulations concerning the protection of proprietary information so submitted to the NRC, the information which is proprietary in the proprietary versions is contained within brackets, and where the proprietary information has been deleted in the non-proprietary versions, only the brackets remain (the information that was contained within the brackets in the proprietary versions having been deleted). The justification for claiming the information so designated as proprietary is indicated in both versions by means of lower case letters (a) through (f) located as a superscript immediately following the brackets enclosing each item of information being identified as proprietary or in the margin opposite such information. These lower case letters refer to the types of information Westinghouse customarily holds in confidence identified in Sections (4)(ii)(a) through (4)(ii)(f) of the affidavit accompanying this transmittal pursuant to 10 CFR 2.390(b)(1).