JAN 05 2006

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10 CFR 50.90

U S Nuclear Regulatory Commission
ATTN: Document Control Desk
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Prairie Island Nuclear Generating Plant Units 1 and 2
Dockets 50-282 and 50-306
License Nos. DPR-42 and DPR-60

Supplement to License Amendment Request (LAR) to Revise the Spent Fuel Pool Criticality Analyses and Technical Specifications (TS) 3.7.17, "Spent Fuel Pool Storage" and 4.3, "Fuel Storage" (TAC Nos. MC5811 and MC5812)

By letter dated February 1, 2005, Nuclear Management Company (NMC) submitted an LAR to revise the spent fuel pool criticality analyses and Technical Specifications (TS) 3.7.17, "Spent Fuel Pool Storage" and 4.3, "Fuel Storage". By letters dated September 16, 2005 and December 2, 2005, NMC provided responses to the NRC requests for additional information regarding this LAR. This letter supplements the subject LAR to address December 19, 2005 telephone discussions with the Nuclear Regulatory Commission (NRC) Staff. NMC is submitting this supplement in accordance with the provisions of 10 CFR 50.90.

The spent fuel pool criticality calculations have been revised to include the effects of uncertainties due to pellet diameter and pellet clad thickness tolerances. Additional calculations were performed to support use of the 5% burnup uncertainty in the calculations which were previously submitted and to determine the effects of a 5% reactivity decrement. The results of these calculations are provided in Enclosure 1. This Enclosure supplements the responses submitted December 2, 2005.

The proposed changes in this supplement do not impact the conclusions of the Determination of No Significant Hazards Consideration and Environmental Assessment presented in the February 1, 2005 submittal as supplemented February 22, 2005, September 16, 2005 and December 2, 2005.

In accordance with 10 CFR 50.91, NMC is notifying the State of Minnesota of this LAR supplement by transmitting a copy of this letter and enclosure to the designated State Official.

Summary of Commitments

This letter contains no new commitments and no revisions to existing commitments.

I declare under penalty of perjury that the foregoing is true and correct.
Executed on JAN 05 2006

Thomas J. Palmisano
Site Vice President, Prairie Island Nuclear Generating Plant Units 1 and 2
Nuclear Management Company, LLC

Enclosure (1)

cc: Administrator, Region III, USNRC
Project Manager, Prairie Island, USNRC
Resident Inspector, Prairie Island, USNRC
State of Minnesota

Enclosure 1

Supplementary Responses to
NRC Request for Information dated July 26, 2005,
Questions 6 and 14.

4 pages follow

Enclosure 1

Supplementary Responses to NRC RAI Questions 6 and 14 on the Prairie Island Spent Fuel Pool Criticality Submittal

Summary of NRC's Request on Question 6:

The reactivity effects of fabrication tolerances on the fuel cladding and pellet diameters are not considered in the Prairie Island analysis. The NRC staff requests that NMC include the tolerances for pellet diameter and clad thickness or demonstrate why they need not be included for the Prairie Island analysis.

Nuclear Management Company (NMC) Response to Question 6:

The reactivity effects of fabrication tolerances from design drawings on the fuel cladding and pellet diameters have been explicitly considered through physics simulations, and the total biases and uncertainties have been updated.

The biases and uncertainties have been slightly impacted by the inclusion of fuel pellet and cladding uncertainties in the consideration of biases and uncertainties for the Prairie Island Units 1 & 2 spent fuel pool storage configurations. The largest positive increase in the total biases and uncertainties is 0.00029 Δk (in the All-Cell configuration), as shown in Table 1. This is within the σ_{KENO} and well below the 0.00500 Δk margin that is included in the licensing submittal.

Table 1. Reactivity Effects of Additional Fabrication Tolerances

Storage Configuration Description	Original Biases & Uncertainties Values (Δk)	Updated Biases & Uncertainties Values (Δk)
All Cell	0.02678	0.02707
Unshimmed 3x3	0.02403	0.02417
Shimmed 3x3	0.02816	0.02635

Enclosure 1

Supplementary Responses to NRC RAI Questions 6 and 14 on the Prairie Island Spent Fuel Pool Criticality Submittal

Summary of NRC's Request on Question 14:

A 5 percent uncertainty on the maximum credited burnup is included in this analysis. However, this is not necessarily the equivalent of the 5 percent reactivity decrement described in the NRC guidance document (Memo from L. Kopp to T. Collins, "Guidance on the Regulatory Requirements for Criticality Analysis of Fuel Storage at Light-Water Reactor Power Plants," Dated August 1998). The staff requests that NMC includes a reactivity decrement or show that the burnup decrement which was included in the Prairie Island analysis is conservative.

Nuclear Management Company (NMC) Response to Question 14:

The original method of including a 5% burnup uncertainty is illustrated here in greater detail, and a justification of its technical merit is included. As supplementary information, the 5% reactivity decrement is determined to demonstrate further confidence in the nuclear criticality safety of the Prairie Island spent fuel pool.

The 5% reactivity decrement assumption for burnup uncertainty that is described in the NRC guidance memorandum has been evaluated for Prairie Island. The updated burnup uncertainty values that are determined using this method are summarized in Table 2. Also included is a summary of the impact on the total biases and uncertainties for each storage configuration.

Table 2. Results of 5% Reactivity Decrement Calculation

Storage Configuration Description	5% Reactivity Decrement (Δk)	Updated Biases & Uncertainties Values (Δk)	Biases & Uncertainties Difference[1] (Δk)
All Cell	0.01331	0.02901	0.00223
Unshimmed 3x3	0.01314	0.02800	0.00397
Shimmed 3x3	0.01312	0.02977	0.00161

[1] This change is relative to the "original biases & uncertainties values" that are included in Table 1. Therefore, the impacts of the additional fabrication tolerances are also included.

Enclosure I

Supplementary Responses to NRC RAI Questions 6 and 14 on the Prairie Island Spent Fuel Pool Criticality Submittal

The above table demonstrates that the difference in the biases & uncertainties remain within the 0.005 Δk margin that is built into this analysis. However, the 5% reactivity decrement method implicitly treats the behavior of reactivity with respect to burnup as a linear relationship. This relationship actually varies with burnup and enrichment, and this linear treatment does not necessarily capture any effects due to these variations. The method of determining the burnup uncertainty utilized in the original analysis does account for variations in the relationship of reactivity with respect to burnup. A more detailed analysis has been performed, and the results are presented in Table 3.

Table 3. Evaluation of 5% Burnup Uncertainty at Various Enrichments and Storage Configurations

Storage Configuration Description	BU_{max} (MWd/MTU)	$\Delta BU_{5\%}$ (MWd/MTU)	5% Burnup Uncertainty (Δk)	WCAP-16517-NP 5% Burnup Uncertainty (Δk)
3 w/o All-Cell	14374	719	0.005647	0.01016
4 w/o All-Cell	25722	1286	0.008489	0.01016
5 w/o All-Cell	37148	1857	0.009152	0.01016
3 w/o Unshimmed 3x3	28363	1418	0.004383	0.00658
4 w/o Unshimmed 3x3	40470	2023	0.005527	0.00658
5 w/o Unshimmed 3x3	52311	2616	0.006490	0.00658
3 w/o Shimmed 3x3	23012	1151	0.006243	0.00752
4 w/o Shimmed 3x3	33995	1700	0.007374[2]	0.00752
5 w/o Shimmed 3x3	45175	2259	0.005754	0.00752

While the 5% burnup uncertainties in the All-Cell and Unshimmed 3x3 configurations do monotonically increase with respect to burnup, they are not necessarily linear. Furthermore, note that the uncertainty for 4 w/o ^{235}U is higher than that for 5 w/o ^{235}U in the Shimmed 3x3 configuration. This demonstrates that the slope changes with burnup, and that a linear representation (utilized in the 5% reactivity decrement method) does not realistically capture the physical nature of a 5% burnup uncertainty. However, the method that was utilized in the original analysis does represent this effect, and it is a technically justified approach of accounting for the 5% burnup uncertainty. The conservatism that is included in the original analysis yields results that remain bounding after a more detailed analysis has been conducted.

[2] A second-order polynomial fit of the 5% burnup uncertainty values vs. fuel enrichment yields a maximum value of 0.007381 Δk at 3.86 w/o ^{235}U. This is slightly higher than that reported here, but still less than the originally reported value.

Enclosure 1

Supplementary Responses to NRC RAI Questions 6 and 14 on the Prairie Island Spent Fuel Pool Criticality Submittal

In addition, if the 5% Δk uncertainties that are obtained with the reactivity decrement method are subsequently converted into equivalent burnup uncertainties (in MWd/MTU), it can be shown that the resulting uncertainty on burnup is quite large. The results of this exercise are shown in Table 4 for 5.0 w/o ^{235}U.

Table 4. 5% Reactivity Decrement Method's Equivalent Burnup Uncertainties

Storage Configuration Description	BU_{max} (MWd/MTU)	Actual $\Delta BU_{5\%}$ (MWd/MTU)	Decrement Method 5% Uncertainty (Δk)	Calculated Burnup Uncertainty (MWd/MTU)	Calculated Burnup Uncertainty (%)
5 w/o All-Cell	37148	1857	0.01331	2701	7.3
5 w/o Unshimmed 3x3	52311	2616	0.01314	5364	10.3
5 w/o Shimmed 3x3	45175	2259	0.01312	5225	11.6

It is shown that the reactivity decrement method does not capture the physical behavior of a 5% burnup uncertainty for certain configurations and enrichments. This is due to the method's assumption that the reactivity varies linearly with burnup. This analysis has shown that reactivity does not necessarily vary linearly with burnup. The method in the original analysis considers the non-linear behavior of reactivity with respect to burnup, and in doing so, realistically captures the intent of a 5% burnup uncertainty. In addition, the burnup uncertainties that correspond to the decrement method's 5% Δk uncertainties have been determined and range from 7.3 to 11.6 %. Note that WCAP-7308-L-P-A, "Evaluation of Nuclear Hot Channel Uncertainties," determines the integrated reaction rate uncertainty is less than 5%. This uncertainty relates directly to burnup (burnup is dependent on power/reaction rate), so a 5% burnup uncertainty is appropriate and conservative. For these reasons, we feel that the original method utilizing a 5% uncertainty on burnup is sufficient to address the burnup uncertainty and to ensure the nuclear criticality safety of the Prairie Island Units 1 & 2 spent fuel pool.