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10 CFR 50.4
10 CFR 50.90

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Ladies/Gentlemen:

DOCKETS 50-266 AND 50-301
TECHNICAL SPECIFICATION CHANGE REQUEST 193
NUCLEAR FUEL STORAGE ENRICHMENTS
POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

In accordance with the requirements of 10 CFR 50.4 and 50.90, Wisconsin Electric Power Company (licensee) hereby requests amendments to Facility Operating Licenses DPR-24 and DPR-27, for Point Beach Nuclear Plant (PBNP), Units 1 and 2, respectively. The proposed amendments will incorporate changes to the plant Technical Specifications. The proposed change, which is discussed in detail below, provides for storage of fuel assemblies of higher enrichment than is currently authorized at Point Beach. Marked-up Technical Specification pages, a safety evaluation, and the determination of no significant hazards consideration are attached.

Description of Current License Condition

Technical Specification Section 15.5.4, "Fuel Storage," Specification 15.5.4.2, delineates the fuel assembly enrichment limits necessary to maintain K_{eff} in the storage pool less than 0.95. This is accomplished by limiting fuel assembly enrichments to 44.8 grams of U-235 per axial centimeter of standard fuel assembly and to 46.8 grams of U-235 per axial centimeter of OFA (Optimized Fuel Assembly) fuel assembly. These enrichments correspond to approximately 4.0 w/o U-235 for a standard fuel assembly and 4.75 w/o for an OFA fuel assembly.

Description of Proposed Changes

We propose to modify Technical Specification 15.5.4, replacing the existing enrichment limits while maintaining the original K_{eff} limits. The new specification will allow storage of both standard and OFA fuel assemblies with enrichments up to 5.0 w/o U-235. The specification will require that assemblies with enrichments greater than 4.6 w/o U-235 incorporate Integral Fuel Burnable Absorbers (IFBAs), as illustrated in Figure 15.5.4-1 of the marked-up Technical Specification pages.

Justification and Basis

Increasing the spent fuel pool enrichment limit will allow greater flexibility in reload design to accommodate increased cycle lengths, production of fewer spent fuel assemblies, and improved fuel cycle economics. In addition, the Technical Specification will be simplified to provide one enrichment limit for all fuel types, and that enrichment limit will be specified in terms easily understood and verified (weight percent U-235 instead of grams of U-235 per axial centimeter of fuel assembly). Finally, the analysis is more conservative than that currently used because it accounts for any potential shrinkage or gaps in the spent fuel pool rack Boraflex.

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The methodologies employed in this analysis and the results obtained have previously been accepted by the NRC for a number of plants including Ginna, South Texas Project, D.C. Cook, Farley, V. C. Summer, and Vogtle.

Spent fuel pool enrichment limits are set to prevent spent fuel pool criticality. Criticality is controlled by maintaining K_{eff} in the spent fuel pool less than 0.95. The methodologies employed in this analysis demonstrate that this limit will be met. The IFBA requirement of the revised Technical Specification compensates for the reactivity gain due to higher enrichments and a more conservative Boraflex treatment. No change in the basis of the Technical Specification is necessary to accommodate higher enrichments.

The requested enrichment limits can be accommodated in the new fuel storage racks under the current analysis, as described in the NRC SER in Amendment Nos. 126 and 130 to Facility Operating License Nos. DPR-24 and DPR-27 (TACS 68862/63), letter from Warren H. Swenson to C. W. Fay, February 23, 1990. For that amendment, which delineates the current license condition for enrichment limits, the new fuel storage racks were analyzed assuming 5.5 w/o OFA fuel assemblies with no neutron absorbers present. This analysis remains bounding for the proposed changes.

We have determined that the proposed amendments do not involve a significant hazards consideration, authorize a significant change in the types or total amounts of any effluent release, or result in any significant increase in individual or cumulative occupational exposure. Therefore, we conclude that the proposed amendments meet the requirements of 10 CFR 51.22(c) (9) and that an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared.

We ask that this Technical Specification Change Request be approved by December 31, 1997, to support fabrication of fuel for the next operating cycle of Unit 1. If you require additional information, please contact us.

Sincerely,

GM Frieser
for

Douglas F. Johnson
Manager-Regulatory Services
and Licensing

RWF

cc: NRC Resident Inspector, NRC Regional Administrator

Subscribed and sworn to before me on
this 24th day of January, 1997

Jacqueline Gorecki
Notary Public, State of Wisconsin

My commission expires 10/26/2000.

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SAFETY EVALUATION

I. INTRODUCTION

Wisconsin Electric Power Company (Licensee) has applied for amendments to Facility Operating Licenses DPR-24 and DPR-27 for Point Beach Nuclear Plant, Units 1 and 2. The proposed revisions modify Technical Specification 15.5.4, "Fuel Storage," Specification 15.5.4.2, replacing the existing enrichment limits. The new specification will allow storage of both standard and OFA fuel assemblies with enrichments up to 5.0 w/o U-235 by requiring that assemblies with enrichments greater than 4.6 w/o U-235 incorporate Integral Fuel Burnable Absorbers (IFBAs). Criticality limits will not change and will not be exceeded as a result of the proposed changes.

II. EVALUATION OF SPENT FUEL STORAGE RACKS

The proposed changes address the need for greater design flexibility by allowing an increase in the spent fuel pool enrichment limit. Simplifying assumptions such as no grids, no sleeves, and no axial blankets allow this analysis to be applicable to future fuel upgrades.

Criticality of fuel assemblies in a spent fuel storage rack is prevented by the design of the rack which limits fuel assembly interaction by fixing the minimum separation between fuel assemblies and inserting neutron poison between them. In addition, criticality control can be added by neutron poison integral to an assembly, such as IFBAs. The design basis for preventing criticality outside the reactor is that, including uncertainties, there is a 95 percent probability at a 95 percent confidence level that the effective neutron multiplication factor (K_{eff}) of the fuel assembly array will be less than 0.95 as recommended by ANSI 57.2-1983 and NRC guidance.

The criticality calculation method and cross-section values were verified by comparison with critical experiment data for fuel assemblies similar to those for which the racks are designed. The computer codes, benchmarking, and methodology which are used to calculate the criticality safety limits presented in this request are described in detail in the Westinghouse Spent Fuel Rack Criticality Analysis Methodology topical report, WCAP-14417, June 1995.

II.A Boraflex Shrinkage and Gap Methodology

As a result of blackness testing measurements at other storage rack facilities, the presence of shrinkage and gaps in Boraflex panels has been noted. Even though Point Beach has not seen similar problems, the effects of Boraflex shrinkage and gaps were considered in the spent fuel rack criticality evaluations performed for this request. To bound the potential development of shrinkage and gaps, the following assumptions were employed in the criticality evaluations performed for the Point Beach storage racks:

1. All absorber panels were modeled with four percent width shrinkage.
2. All absorber panels were modeled with four percent length shrinkage which was assumed to occur either uniformly (where the panel remains intact over its entire length) or non-

uniformly (where a conservative, single four-inch gap develops somewhere along the panel length).

3. For those panels which were modeled with a gap, the remainder of the four percent length shrinkage not accounted for by the single four-inch gap was conservatively applied a bottom or top end shrinkage.
4. Gaps were distributed randomly with respect to axial position for the absorber panels which were modeled with gaps.
5. Determination of which panels experience shrinkage and which experience gaps was based on random selection. Several scenarios were considered to cover the complete spectrum of shrinkage and gap combinations.
6. A criticality model which simulates 16 storage cells and 64 individual absorber panels was employed to provide sufficient problem size and flexibility for considering gaps and shrinkage on a random basis.
7. All absorber material which is lost to shrinkage or gaps was conservatively removed from the model. In reality, not all absorber material is lost -- it is simply repositioned by shrinkage to the remaining intact areas of the panel.

These assumptions are bounding with respect to the upper bound values for shrinkage and gaps recommended by Electric Power Research Institute (EPRI) in *Boraflex Test Results and Evaluation*, EPRI TR-101986, Interim Report, February, 1993. These assumptions have been used in previous NRC-approved criticality reports relating to Boraflex gaps and shrinkage.

<u>II.B Reactivity Calculations</u>

Reactivity calculations were performed for assemblies with nominal enrichments up to and including 4.6 w/o U-235. To show that storage of burned and fresh Westinghouse 14x14 OFA or 14x14 STD fuel assemblies in the Point Beach spent fuel racks satisfies the 0.95 K_{eff} criticality acceptance criteria, KENO was used to establish a nominal reference reactivity and PHOENIX-P was used to assess the effects of material and construction tolerance variations. The nominal temperature range of 50°F to 180°F was considered in the analysis. A final 95/95 K_{eff} was developed by statistically combining the individual tolerance impacts with the calculational and methodological uncertainties and summing this term with the nominal KENO reference reactivity.

The KENO calculation for the nominal case resulted in a K_{eff} of 0.92921 with a 95 percent probability/95 percent confidence level uncertainty of 0.00146 ΔK. This K_{eff} is the nominal reactivity assuming no Boraflex shrinkage or gaps. To conservatively evaluate the effects of Boraflex shrinkage and gap development, the methodology described above was employed. Five shrinkage/gap scenarios were examined to cover the spectrum of shrinkage-to-gap ratios from 100 percent gaps and 0 percent shrinkage through 0 percent gap and 100 percent shrinkage. Assignment of which panels have gaps or shrinkage, and the axial location of the gap, is based on random selection.

Of the five KENO cases evaluated, the 50 percent gaps and 50 percent shrinkage case resulted in the highest K_{eff}. The KENO K_{eff} for this case of Boraflex gaps and shrinkage is 0.93176 with a 95/95 uncertainty of 0.00146 ΔK. This K_{eff} is used as the reference reactivity for the Point Beach spent fuel rack configuration.

Calculational and methodological biases were considered in the final K_{eff} summation prior to comparing against the 0.95 K_{eff} limit. These biases included a methodology bias to cover

benchmarking of the Westinghouse KENO Va methodology, a B-10 self-shielding bias to correct for the modeling assumption that individual B-10 atoms are homogeneously distributed within the absorber material, and a water temperature bias to account for the effect of the normal temperature range of spent fuel pool water on water cross-section properties.

To evaluate the reactivity effects of possible variations in material characteristics and mechanical/construction dimensions, PHOENIX-P perturbation calculations were performed. For the Point Beach spent fuel rack configuration, UO_2 material tolerances (U-235 enrichment and UO_2 density) were considered along with construction tolerances related to the storage cell I.D., storage cell pitch, and Boraflex absorber width and thickness. Asymmetric assembly positioning within a storage cell was considered. Uncertainties associated with calculation and methodology accuracy were also considered in the statistical summation of uncertainty components.

The maximum K_{eff} for the Point Beach spent fuel rack storage configuration was developed by adding the calculational and methodological biases and the statistical sum of independent uncertainties to the KENO reference reactivity. This summation resulted in a maximum K_{eff} of 0.94876. Because K_{eff} is less than 0.95 including uncertainties at a 95/95 probability/confidence level, the acceptance criteria for criticality is met for storage of Westinghouse 14x14 OFA or 14x14 STD fuel assemblies with nominal enrichments up to and including 4.6 w/o U-235 in the Point Beach spent fuel racks.

II.C Reactivity Equivalencing

Storage of fuel assemblies with initial enrichments higher than 4.6 w/o U-235 is achievable by means of the concept of reactivity equivalencing, which has been previously approved by the NRC. Reactivity equivalencing is predicated upon the reactivity decrease associated with the addition of IFBA fuel rods. A series of reactivity calculations is performed to generate a set of enrichment-IFBA ordered pairs which all yield an equivalent K_{eff} when the fuel is stored in the fuel racks. The data points on the reactivity equivalence curve are generated with the transport theory code, PHOENIX-P. PHOENIX-P is a depletable, two-dimensional, multigroup, discrete ordinates, transport theory code which uses a 42 energy group nuclear data library.

Two analytical techniques are used to establish the criticality criteria for the storage of IFBA fuel in the fuel storage rack. The first method uses reactivity equivalencing to establish the poison material loading required to meet the criticality limits. The poison material considered in this analysis is ZrB_2 coating manufactured by Westinghouse. Each IFBA rod has a nominal poison material loading of 1.67 milligrams B-10 per inch at 1.0X loading, which is the minimum standard loading offered by Westinghouse for 14x14 OFA fuel assemblies. 1.5X and 2.0X IFBA loadings are nominally 2.50 and 3.34 milligrams B-10 per inch, respectively. The second method uses the fuel assembly infinite multiplication factor to establish a reference reactivity. The reference reactivity point is compared to the fuel assembly peak reactivity to determine its acceptability for storage in the fuel racks.

II.C.1 IFBA requirement determination

A series of reactivity calculations are performed to generate a set of IFBA rod number versus enrichment ordered pairs which all yield the equivalent K_{eff} when the fuel is stored in the spent fuel racks. Uncertainties associated with the IFBA-dependent reactivity computed with PHOENIX-P are accounted for in the development of the individual reactivity equivalence

limits. Proposed Technical Specification Figure 15.5.4-1 shows the constant K_{eff} contour generated for the Point Beach spent fuel racks. The interpretation of the endpoint data is as follows: the reactivity of the fuel rack array when filled with fuel assemblies enriched to a nominal 5.0 w/o U-235 with each containing 16 (at 1.0X) IFBA rods is equivalent to the reactivity of the rack when filled with fuel assemblies enriched to a nominal 4.6 w/o U-235 and containing no IFBAs.

It is important to recognize that the curve in Figure 15.5.4-1 is based on reactivity equivalence calculations for the specific enrichment and IFBA combinations in actual rack geometry, and not just on simple comparisons of individual fuel assembly infinite multiplication factors. In this way, the environment of the storage rack and its influence on assembly reactivity is implicitly considered.

The IFBA requirements of Figure 15.5.4-1 were developed based on standard IFBA patterns used by Westinghouse. However, because the worth of individual IFBA rods can change depending upon position within the assembly (due to local variations in flux), studies were performed to evaluate this effect and a conservative reactivity margin was included in the development of the IFBA requirement to account for this effect. This assures that the IFBA requirement remains valid at intermediate enrichments where standard IFBA patterns may not be available. In addition, to conservatively account for calculational uncertainties, the IFBA requirements of Figure 15.5.4-1 also include a conservatism of approximately 10 percent on the total number of IFBA rods.

Additional IFBA credit calculations were performed to examine the reactivity effects of higher IFBA linear B-10 loadings (1.5X and 2.0X). These calculations confirm that assembly reactivity remains constant provided the net B-10 material per assembly is preserved. Therefore, with higher IFBA B-10 loadings, the required number of IFBA rods per assembly can be reduced by the ratio of the higher loading to the nominal 1.0X loading. For example, using 2.0X IFBA in 5.0 w/o U-235 fuel assemblies allows a reduction in the IFBA rod requirement from 16 IFBA rods per assembly to 8 rods per assembly (16 divided by the ratio 2.0X/1.0X).

II.C.2 Infinite multiplication factor

The infinite multiplication factor, K_∞, is used as a reference criticality reactivity point, and offers an alternative method for determining the acceptability of fuel assembly storage in the spent fuel racks. Calculation of the infinite multiplication factor for the Westinghouse 14x14 OFA fuel assembly in the Point Beach core geometry at cold condition resulted in a reference K_∞ of 1.49364. This includes a 1% ΔK reactivity bias to conservatively account for calculational uncertainties. This bias is consistent with the standard conservatism included in the Point Beach core design refueling shutdown margin calculations.

For IFBA credit, all Westinghouse 14x14 fuel assemblies placed in the Point Beach spent fuel racks must comply with the enrichment-IFBA requirements of Figure 15.5.4-1 or have a reference K_∞ less than or equal to 1.49364. By meeting either of these conditions, the maximum rack reactivity will be less than 0.95.

II.D Consideration of Credible Postulated Accidents

Most accident conditions will not result in an increase in K_{eff} of the spent fuel racks. For example, a loss of spent fuel pool cooling will insert negative reactivity because a loss of cooling

increases coolant temperature, which decreases coolant density. This results in an insertion of negative reactivity.

However, two credible accidents can be postulated which would insert positive reactivity beyond the analyzed condition. One such postulated accident would be placement of a fresh fuel assembly of the highest possible enrichment outside and adjacent to a storage rack module. In a conservative analysis, the impact of loading a fresh assembly at 4.6 w/o U-235 adjacent to an outside face, which has no Boraflex, of a 4x5 array of fuel rack cells loaded with fresh 4.6 w/o U-235 fuel assemblies was determined to be a positive reactivity increase less than 0.024 ΔK. A second accident which could result in a reactivity increase would be a cooldown event where the spent fuel pool temperature would drop below 50°F. Calculations show that if the water decreased from 50°F to 32°F, positive reactivity would increase by about 0.00081 ΔK.

For occurrences of any of these postulated accidents, the double contingency principle of ANSI/ANS 8.1-1983 can be applied. This states that one is not required to assume two unlikely, independent, concurrent events to ensure protection against a criticality accident. Thus, for these postulated accident conditions, the presence of soluble boron in the storage pool water can be assumed as a realistic initial condition because assuming its absence would be a second unlikely event.

To bound the 0.024 ΔK positive reactivity increase from the most limiting accident in the spent fuel racks, it is estimated that 250 ppm of soluble boron is needed, far below the 1800 ppm boron required by Technical Specification 15.5.4.3. Therefore, should a postulated accident occur which causes a reactivity increase in the Point Beach spent fuel racks, K_{eff} will be maintained less than 0.95 due to the presence of at least 250 ppm of soluble boron in the spent fuel pool water.

III. EVALUATION OF NEW FUEL STORAGE RACKS

The analyses which were performed to support the current license condition for the new fuel storage racks also bound the proposed enrichment limit changes. As described in the NRC SER in Amendment Nos. 126 and 130 to Facility Operating License Nos. DPR-24 and DPR-27 (TACS 68862/63), letter from Warren H. Swenson to C. W. Fay, February 23, 1990, the new fuel storage rack analysis assumed Westinghouse 14x14 OFA fuel at an enrichment of 5.5 w/o and no neutron absorbers present. At equivalent enrichment, an OFA fuel assembly is more reactive than a standard fuel assembly, thus the assumption of OFA fuel is conservative.

In addition to the baseline case for a flooded cavity, calculations were performed for elevated temperatures and for mist conditions with water densities ranging from 3 to 80 percent of maximum water density. In addition, the increase in K_{eff} due to fuel position uncertainties and due to the maximum fuel pellet density were taken into account. The combination of these biases and uncertainties yielded a maximum expected value of K_{eff} for the new fuel storage racks of 0.9221 for the fully flooded case. This value of K_{eff} is acceptable because it is less than the 0.95 limit. The presence of IFBA in an assembly will only add margin to the limit. Thus, the storage of fuel assemblies at or below 5.5 w/o in the new fuel storage racks is acceptable under the current license condition.

IV. CONCLUSION

For the storage of fuel assemblies in the spent fuel and new fuel storage racks, the acceptance criterion for criticality requires the effective neutron multiplication factor, K_{eff}, to be less than 0.95, including uncertainties, under all conditions. The acceptance criterion is met for the Point Beach spent fuel storage racks for the following configurations and enrichment limits: Storage of Westinghouse 14x14 OFA and 14x14 STD fuel assemblies with nominal enrichments up to and including 4.6 w/o U-235 in any available cells is allowed. Fresh fuel assemblies with higher initial nominal enrichments up to and including 5.0 w/o U-235 can also be stored in any available cell provided a minimum number of IFBAs are present in each of these fuel assemblies, per proposed Technical Specification Figure 15.5.4-1. In the alternative, the acceptance criterion for the Point Beach spent fuel storage racks is also met with Westinghouse 14x14 fuel assemblies having a reference K_{∞} less than or equal to 1.49364. In addition, maintaining at least 250 ppm of soluble boron in the spent fuel pool water is required to mitigate the consequences of a postulated accident.

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NO SIGNIFICANT HAZARDS CONSIDERATION

In accordance with the requirements of 10 CFR 50.91(a), Wisconsin Electric Power Company (Licensee) has evaluated the proposed changes against the standards of 10 CFR 50.92 and has determined that the operation of Point Beach Nuclear Plant, Units 1 and 2, in accordance with the proposed amendments does not present a significant hazards consideration. The analysis of the requirements of 10 CFR 50.92 and the basis for this conclusion are as follows:

1. Operation of this facility under the proposed Technical Specifications will not create a significant increase in the probability or consequences of an accident previously evaluated.

The proposed changes do not involve a change to structures, systems, or components which would affect the probability or consequences of an accident previously evaluated in the PBNP Final Safety Analysis Report (FSAR). The only relevant concern with respect to increasing enrichment limits in the spent fuel pool and new fuel storage racks is one of criticality. The proposed changes use the same criticality limit used in the current Technical Specifications. Therefore, margin to safe operation of Units 1 and 2 is maintained. The probability and consequences of an accident previously evaluated are dependent on this criticality limit. Because the limit will not change, the probability and consequences of those accidents previously evaluated will not change.

2. Operation of this facility under the proposed Technical Specifications change will not create the possibility of a new or different kind of accident from any accident previously evaluated.

The proposed changes do not involve a change to plant design. The proposed increase in spent fuel pool and new fuel storage racks fuel assembly enrichment limits maintains the margin to safe operation of Units 1 and 2 because the criticality limit for the spent fuel pool and new fuel storage racks will not change. These changes do not affect any of the parameters or conditions that contribute to the initiation of any accidents. Because the criticality limit remains the same, these changes have no effect on plant operation, design, or initiation of any accidents. Therefore, the proposed changes will not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Operation of this facility under the proposed Technical Specifications change will not create a significant reduction in a margin of safety.

The proposed changes maintain the margin to safe operation of Units 1 and 2. The margin of safety is based on the criticality limit of the spent fuel pool and the new fuel storage racks. Because this limit will not change, the margin of safety will not be affected. Therefore, the proposed changes will not create a significant reduction in a margin of safety.