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SUBJECT: Submits addl info in support of 890411 license amend re TS changes revising limit for max fuel enrichment.

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A. B CUTTER
Vice President
Nuclear Services Department

United States Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, DC 20555

SHEARON HARRIS NUCLEAR POWER PLANT
DOCKET NO. 50-400/LICENSE NO. NPF-63
FUEL ENRICHMENT INCREASE

Gentlemen:

Carolina Power & Light Company (CP&L) hereby submits additional information in support of the Shearon Harris Nuclear Power Plant license amendment requested dated April 11, 1989 concerning Technical Specification changes revising the limit for maximum fuel enrichment. This information is submitted in response to an NRC request for additional information dated June 7, 1989. The responses to these NRC questions are attached. This information was previously transmitted by CP&L letter dated June 29, 1989; however, it is being resubmitted under oath and affirmation as requested by the NRC staff.

Please refer any questions regarding this submittal to Mr. John Eads at (919) 546-4165.

Yours very truly,

A. B. Cutter

ABC/JHE/crs (424CRS)
Attachment

cc: Mr. R. A. Becker
Mr. W. H. Bradford
Mr. S. D. Ebneter

A001

A. B. Cutter, having been first duly sworn, did depose and say that the information contained herein is true and correct to the best of his information, knowledge and belief; and the sources of his information are officers, employees, contractors, and agents of Carolina Power & Light Company.

Lewis S. Rowell
Notary (Seal)

LEWIS S. ROWELL NOTARY PUBLIC WAKE COUNTY, N.C.

My commission expires: 7/12/94

NRC QUESTION 1

Your depletion calculations have shown that for the number of IFBA rods per assembly considered in the analysis (e.g., 48 IFBAs per initially enriched 5.0 weight percent assembly), the maximum reactivity occurs at zero burnup. Explain how this has been verified for a larger number of IFBAs per assembly considering such effects as neutron spectrum hardening.

SHNPP RESPONSE

Unit assembly calculations have shown that as the number of IFBA rods per assembly is increased above 48 in a high enriched assembly, the maximum reactivity of that assembly does not exceed the reactivity of a 48 IFBA assembly at zero burnup. At approximately 64 IFBA rods per assembly, the maximum fuel assembly reactivity occurs between 2000 and 4000 MWD/MTU due to the resulting neutron spectrum and depletion characteristics of the IFBA fuel; however, this peak reactivity is always less than the zero burnup reactivity from the same assembly with 48 IFBA rods.

NRC QUESTION 2

Since TS 5.3.1 refers to fuel assemblies containing a sufficient number of IFBAs, why is not Figure 2 or Table 2 which gives the minimum number of IFBA rods versus initial U-235 enrichment for acceptable fuel storage included in the Technical Specifications?

SHNPP RESPONSE

The only requirement needed to ensure that the fuel racks are maintained at $k_{eff} \leq 0.95$ is to verify that for each assembly the k_∞ is ≤ 1.470 at $68^{o}F$ in core geometry. The figure and table of IFBA rods versus enrichment is a convenient way for the core designer and utility to verify that the k_∞ limit is met if the particular bundle design meets the assumptions under which the figure was generated. Placed in the Technical Specifications, the figure and table would overly limit the IFBA (ZrB2) distributions available and would eliminate the use of other integral burnable absorbers, as in Gd203.

NRC QUESTION 3

Can the distribution of IFBA rods vary between assemblies as compared to the distribution assumed in the analysis. If so, what effect does this have on the rack reactivity results?

SHNPP RESPONSE

Although Westinghouse uses standard IFBA rod patterns in the fuel assemblies, variations in these standard patterns can occur. As a result, the criticality analysis is based on non-standard IFBA rod patterns which result in higher fuel assembly and fuel rack reactivities. These results bound the reactivities from the standard Westinghouse IFBA rod patterns used in Figure 2 and Table 2. To determine if fuel is acceptable for storage in the fuel racks, each fuel assembly enrichment/IFBA pattern combination is evaluated. If a non-standard pattern is being used, then the assembly infinite reactivity is evaluated and compared to the reference fuel assembly reactivity (1.470) to

determine if it is acceptable to store the fuel assembly in the fuel racks. As a result, each enrichment/IFBA pattern combination that is not bound by the criticality analysis (i.e., non-standard pattern not used in the analysis) is evaluated on a case-by-case basis using the fuel assembly reactivity.

NRC QUESTION 4

In view of the recent Licensee Event Report filed by McGuire Unit 1 concerning shrinkage of Boraflex which could cause a resultant increase in reactivity not previously considered, justify that the Shearon Harris spent fuel pool maximum anticipated Boraflex shrinkage will not violate the 0.95 k_{eff} acceptance criterion.

SHNPP RESPONSE

The LER filed by the McGuire Nuclear Station, Unit 1 was prompted by the discovery that the as-built Boraflex panels at McGuire were shorter than the fuel stacks of the stored fuel assemblies. With elevation differences this resulted in up to five inches of the fuel stacks being uncovered. It was then postulated that if all the shrinkage were to appear at the cutback end of the Boraflex panels, the post-shrinkage cutback could be up to 9 inches.

Fuel rack calculations for SHNPP have shown that the Boraflex poison panel length can be reduced to expose over four inches of active fuel length at the ends of the fuel assemblies with no significant effect on the fuel rack reactivity. The SHNPP PWR fuel rack design positions the Boraflex poison panels such that they cover the entire active fuel length before any shrinkage is considered. As a result, a maximum shrinkage of three percent of the poison panel length will expose approximately four inches of active fuel length at the top of the fuel assembly and have no significant effect on the fuel rack reactivity and the acceptance criterion of $\leq$ 0.95 is maintained.

NRC QUESTION 5

If new fuel assemblies of five weight percent U-235 enrichment can also be stored dry in new (unirradiated) fuel storage racks, provide the appropriate reactivity analysis for these showing that the k_{eff} acceptance criteria of 0.98 for optimum moderation and 0.95 for fully flooded conditions are met.

SHNPP RESPONSE

Fresh fuel stored at SHNPP is placed in the same type of fuel racks as the spent fuel. Therefore, the reactivity analysis for the spent fuel storage racks is applicable to the fresh fuel. It is noted in the reactivity analysis that the optimum moderation event occurs at the maximum moderator density (1 gm/cc) due to the presence of poison plates; the calculated k_{eff} is less than 0.95. It is also noted that the rack reactivity continuously decreases as moderator density decreases from 1.0 g/cc to 0.0 g/cc. This differs from the behavior seen in fresh fuel racks designed with a lower packing factor and without the poison plates since these experience a reactivity spike at aerosol conditions that exceeds the reactivity associated with the maximum moderator density.

NRC QUESTION 6

The presence of approximately 2000 ppm boron in the pool water is assumed for postulated accidents. Is this a minimum Technical Specification requirement and is there a corresponding surveillance requirement for periodic sampling?

SHNPP RESPONSE

The presence of 2000 ppm boron is only a Technical Specification requirement at SHNPP while in Mode 6 and is verified at intervals of 72 hours. At all other times the boron concentration is verified to be ≥ 2000 ppm via performance of Administrative Procedure CRC-001 once a week.

NRC QUESTION 7

It appears that revised TS 5.6.1.b referring to new fuel for the first core loading stored dry in the spent fuel racks is no longer applicable and should be deleted.

SHNPP RESPONSE

Since the SHNPP Technical Specifications are being revised to reflect changes necessary for Cycle 3, it is true that references to Cycle 1 could be deleted. However, the presence of TS 5.6.1.b does not impact any other Technical Specification and is consistent with other references to the first core in the Technical Specifications.