FLORIDA POWER & LIGHT COMPANY

June 15, 1984
L-84-152

Office of Nuclear Reactor Regulation
Attention: Mr. Steven A. Varga, Chief
Operating Reactors Branch #1
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

RE: Turkey Point Units 3 & 4
Docket Nos. 50-250 & 50-251
Fuel Storage U-235 Linear Loading Increase

Gentlemen:

Your letter dated May 4, 1984 requested additional information associated with Florida Power & Light's request to modify Turkey Point Units 3 and 4 Technical Specifications in relation to U-235 linear loading and deletion of the reactor core U-235 enrichment specification.

The information provided in Attachment A is submitted in response to that request.

A verbal request for additional information from Mr. Dan McDonald of your office was received on May 23, 1984. The information provided in Attachment B is submitted in response to that request.

Very truly yours,

J. W. Williams
Group Vice President

JWW/ERK/daj
Attachments

cc: J. P. O'Reilly, Region II
Harold F. Reis, Esquire

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PEOPLE... SERVING PEOPLE

ATTACHMENT A

Question 1. Please indicate which organization performed the previously approved criticality calculations for the Turkey Point fuel storage racks and which is performing the current analysis. If these two organizations are not the same, then we require that the organization performing the current analysis provide its own benchmarking results against critical experiments.

Response 1. The previously approved criticality analysis for Turkey Point fuel storage racks was performed by Combustion Engineering. The current analysis was performed by the Southern Science office of Black & Veatch. The benchmarking results of this organization are provided in Reference 7 of the Safety Analysis Report for the current analysis.

Question 2. Although the criticality calculations for the unirradiated fuel in the new fuel storage racks correctly considered both low density and fully flooded (unborated) water conditions, the wording of proposed Technical Specification 5.4.2 is misleading. The specification should clearly state that k_{eff} must be less than or equal to 0.98 for optimum moderation (usually low density) conditions and less than or equal to 0.95 for fully flooded (unborated) conditions.

Response 2. The proposed Technical Specification 5.4 wording is amended to clearly state that k_{eff} must be less than or equal to 0.98 for optimum moderation conditions and less than or equal to 0.95 for fully flooded conditions. The amendment to the proposed Technical Specification 5.4 is attached.

Proposed Technical Specification
Turkey Point Units 3 and 4

5.4 Fuel Storage

1. The new and spent fuel pit structures are designed to withstand the anticipated earthquake loadings as Class 1 structures. Each spent fuel pit has a stainless steel liner to ensure against leakage.

2. The new and spent fuel storage racks are designed so that it is impossible to insert assemblies in other than the prescribed locations. The fuel in the spent fuel pit is stored vertically in an array with sufficient center-to-center distance between assemblies to assure k_{eff} equal to or less than 0.95 with the new fuel containing not more than 52.4 grams of U-235 per axial centimeter of fuel assembly even if boron was not added to the pit water.

   The fuel in the new fuel storage racks is stored vertically in an array with sufficient center-to-center distance between assemblies to assure k_{eff} equal to or less than 0.98 for optimum moderation conditions and equal to or less than 0.95 for fully flooded conditions, with new fuel containing not more than 57.7 grams of U-235 per axial centimeter of fuel assembly even if boron was not added to the pit water.

3. The boron concentration in the spent fuel pit is that used in the reactor cavity and refueling canal during refueling operations, whenever there is fuel in the pit, except for initial new fuel storage.

ATTACHMENT B

Question 3. UO_2 stack density is given as 10.08 grams per axial centimeter on pages 10 and 13. These should be in units of grams per cubic centimeter.

Response 3. The units of the UO_2 stack density given on pages of 10 and 13 of the Safety Analysis Report as 10.08 grams per axial centimeter, are a typographical error and is amended to correctly read 10.08 grams per cubic centimeter.

Question 4. With reference to the fresh fuel storage racks:

a. What uncertainties and biases were included in the calculated k_{eff} values as a function of low-density water?

b. What uncertainties and basis were included in the calculated k_{eff} for fully flooded conditions?

c. What diffusion theory model was used for fully flooded calculations?

Response 4. a. The maximum calculated k_{eff} value of 0.925 at the "optimum" moderator density of 0.10 g/cm^3 does not include any bias or uncertainty. The large margin in reactivity below the limiting value of 0.98 (i.e., 0.055 ΔK) is more than adequate to accommodate any reasonably expected uncertainties. Benchmarking of the 123-group AMPX-KENO calculational method, given in Reference 7 of the licensing document, suggests bias of 0.0 with an uncertainty of ~0.008 due to calculational uncertainty and the water gap between fuel assemblies (at 10% density). Although no critical experiments at the hypothetically low water density of optimum moderation are available, Napolitano, et. al., have compared the 123-group AMPX-KENO model with continuous energy SAM-CE calculations ("Validation of the NITAWL-KENO Methodology in Modeling New Fuel Storage Criticality", Trans. Am. Nucl. Soc. 44, 291, 1983). These results showed very good agreement which provides additional confidence that the calculated k_{eff} value for the Turkey Point new fuel storage racks, at optimum moderation, establishes the criticality safety of racks with a substantial margin below the limiting value.

b. The fully-flooded k_{eff} value, calculated for the new fuel storage rack (0.9175 ± .0075 (95%, 95%) by AMPX-KENO or 0.9219 by diffusion theory), does not include any allowance for bias or uncertainties. In the flooded condition, the fuel assemblies are essentially isolated from each other by the large lattice spacing which provides more than 30 cm between assemblies. AMPX-KENO has been benchmarked, as described in the licensing document, with a bias of zero and an uncertainty of ±0.003. Thus, the calculated k_{eff} value is sufficiently below the limiting value of 0.95 (by 0.025 Δk minimum) to establish the criticality safety of the storage rack for any reasonable bias or uncertainty. The diffusion theory calculation, used as an independent check and verification of the AMPX-KENO calculation, provides additional confidence in the criticality calculation for an isolated fuel assembly.

c. As described in the licensing submittal, the diffusion theory model was the B&W multi-group cross section cell homogenization code, NULIF, used to prepare input constants for the PDQ07 two-dimensional diffusion theory code.

[illegible]