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SUBJECT: Responds to 860904 request for addl info re review of proposed fuel enrichment Tech Spec amend to increase max fuel enrichment from 3.7 to 4.0 weight percent U-235.

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OCTOBER 06 1986

L-86-399

Office of Nuclear Reactor Regulation
Attention: Mr. Ashok C. Thadani, Director
PWR Project Directorate #8
Division of PWR Licensing-B
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Thadani:

Re: St. Lucie Unit 1
Docket No. 50-335
Fuel Enrichment

By letter L-86-251, dated July 8, 1986, Florida Power & Light Company (FPL) proposed to amend Technical Specification 5.6.1. to increase the maximum fuel enrichment from 3.7 weight percent to 4.0 weight percent of U-235. This proposed amendment will allow increased flexibility in fuel management and will accommodate storage of higher enrichments for possible use in future cycles.

By letter dated September 4, 1986 (E. G. Tourigny to C. O. Woody), the NRC identified additional information required to continue its review of the proposed Fuel Enrichment Technical Specification amendment. The attached responds to the staff's request for additional information.

Please contact us if you have any questions about this submittal.

Very truly yours,

C. O. Woody
Group Vice President
Nuclear Energy

COW/EJW/gp

Attachment

cc: Dr. J. Nelson Grace, Region II, USNRC
Mr. Alan Schubert, Florida Dept. of Health and Rehabilitative Services
Harold F. Reis, Esquire

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ATTACHMENT

REQUEST FOR ADDITIONAL INFORMATION
ST. LUCIE UNIT 1 FUEL ENRICHMENT INCREASE
TAC NO. 61940

1. What is the nominal value of k_{eff} calculated for the new fuel storage array fully flooded with pure (unborated) water?

Response:

As stated on Page 6 of XN-NF-83-36, Rev. 1, the new fuel storage array will remain subcritical for the case of full flooding because of neutron isolation between assemblies. (Eleven inches of water between assemblies will neutronically isolate one from another.) Exxon Nuclear Company (ENC) has, however, performed a k-effective calculation for a single 4.0 w/o enriched fuel assembly defined in Table 1 of XN-NF-83-36, Rev. 1. The calculated k-effective for this assembly is 0.869 $\pm$ 0.006 for the fully flooded array under all credible conditions.

2. What value was assumed for the uncertainty in the new fuel storage array calculations? Justify its use to predict k-effective at the 95% confidence level.

Response:

The following uncertainties were considered in performing the new fuel storage array analysis:

a. benchmark k-effective results;

b. statistical and / or convergence uncertainties in calculation of k-effective;

c. material and fabrication tolerances; and

d. uncertainties due to limitations in the geometrical and material representations used in calculation of the array k-effective.

Because there is essentially no critical experiment data available specifically for LWR fuel at low moderation, ENC has benchmarked the calculation methodology used for the St. Lucie new fuel storage array against low moderation uranium oxide criticals performed at Rocky Flats in the early 1980s. (These experiments and ENC calculations results are summarized in Reference 2 of the third response.) The experiments

investigate the effects of concrete and plexiglas reflection on low-enriched (4.5 w/o U-235) undermoderated (H/U=1) uranium oxide. Geometrically, the experiments deviate from LWR fuel in that the uranium oxide is packed in six inch cube aluminum cans rather than as pellets in zirconium tubing.

Results of these benchmark calculations indicate that XSDRNPM/KENO IV overpredicts the critical eigenvalue of the experiments by 2-3% delta-k. This calculational conservatism would more than account for any uncertainty associated with the St. Lucie new fuel storage array material and fabrication tolerances. The geometric and material representations of the storage array in the calculation model are either exact or by design modeled to be conservative relative to array reactivity. Hence, any uncertainty associated with the geometric and material representations of the storage array is accounted for in the modeling of the array. Based on this information, the uncertainty for the new fuel storage array calculations becomes only that associated with the statistical nature of the KENO IV calculation methodology which is 0.01 (2σ) for Case 2 in Table III of the St. Lucie report (XN-NF-83-36, Rev. 1).

3. Provide information concerning the critical experiments used for benchmarking to validate that they simulate the features of the St. Lucie Unit 1 fuel storage racks, such as enrichment, spacing, materials, etc.

Response:

Critical experiments and results of ENC benchmark calculations are provided in the following two reference documents:

1. "Criticality Safety Benchmark Calculations for Low-Enriched Uranium Metal and Uranium Oxide Rod-Water Lattices", XN-N-499, Exxon Nuclear Company, April 1979.

2. "Criticality Safety Benchmark Calculations for Low-Enriched Undermoderated Uranium Oxide Systems", XN-NF-684, Rev. 1, Exxon Nuclear Company, February 1983.

For the new fuel storage array calculations, the critical experiments used to benchmark the calculation methodology are briefly described in response to Question #2. For the water-flooded LWR benchmark calculations, these experiments included 2.7 w/o U-235 stainless steel clad UO_2 rods in water (Yankee Criticals), 4.95 w/o U-235 unclad uranium metal rods in water (ORNL Experiments) and 2.35 w/o U-235 aluminum clad UO_2 rods in water with steel and boral sheets (Battelle-PNL Criticals). These criticals are defined in more detail in FPL letter L-86-251 dated July 8, 1986.