July 18, 2003

Mr. J. A. Stall
Senior Vice President, Nuclear and
Chief Nuclear Officer
Florida Power and Light Company
P.O. Box 14000
Juno Beach, Florida 33408-0420

SUBJECT: TURKEY POINT PLANT UNITS 3 AND 4 - REQUEST FOR ADDITIONAL INFORMATION REGARDING ADDITION OF CASK AREA SPENT FUEL STORAGE RACKS AMENDMENT (TAC NOS. MB6909 AND MB6910)

Dear Mr. Stall:

By a letter dated November 26, 2002, Florida Power and Light Company submitted a request for proposed license amendments that would modify the Turkey Point Units 3 and 4 Technical Specifications (TS). The proposed amendments would revise TS Section 5.6, Design Features – Fuel Storage, to include the design of a new cask area spent fuel storage rack for each unit. The U.S. Nuclear Regulatory Commission staff has reviewed the submittal and finds that a response to the enclosed request for additional information is needed before we can complete the review.

This request was discussed with your staff on July 14, 2003, and Ms. Stavroula Mihalakea agreed that a response would be provided by September 12, 2003. If you have any questions, please feel free to contact me at (301) 415-2315.

Sincerely,

/RA/

Eva A. Brown, Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-250 and 50-251

Enclosure: As stated

cc w/encl: See next page

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REQUEST FOR ADDITIONAL INFORMATION

ADDITION OF SPENT FUEL POOL CASK AREA RACK AMENDMENT

FLORIDA POWER AND LIGHT

TURKEY POINT, UNITS 3 AND 4

DOCKET NOS. 50-250 AND 50-251

1. The Florida Power and Light Company (FPL) submittal indicates that materials containing boron will be part of the design of the spent fuel storage racks that will be installed in the cask area.

   Provide the quantity of additional tritium that is expected to be produced and released. Discuss the significance of any estimated increase.

2. The additional stored spent fuel will increase the amount of heat being removed from the water in the spent fuel pool (SFP) and cask area.

   Describe the amount of additional heat that may be released to the cooling canal. Discuss the significance of any estimated increase.

3. According to Section 9.6 of the submittal, all spent fuel and spent fuel storage racks will be removed from the cask area before a cask is brought into the area. Discuss how this restriction will be formally controlled.

4. Describe the extent of station health physics technician (HPT) involvement and required direct coverage (continuous or intermittent) during the following evolutions (phases) of the project: (1) pre-job planning/briefings, (2) cask area pool-bottom vacuuming/cleaning, (3) rack installation, and (4) rack removal, decontamination, and storage.

5. Section 9.4, page 9-2 of Holtec Report HI-2022931, “Spent Fuel Storage Expansion at Turkey Point Nuclear Plant for Florida Power and Light” (the Holtec report), appears to take credit for installed air monitoring equipment for identifying unexpected increases in airborne radioactivity during the rack project. In general, the NRC staff believes that these installed process monitors/systems are for providing appropriate radiation alarms, building ventilation isolations, quantifying radioactive effluents, etc., but are not appropriate for meeting the Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20 survey requirements for monitoring occupational worker intakes of radioactive materials (installed air monitors are too slow in responding and do not provide representative sampling of local work areas).

   Describe how 10 CFR Part 20 air sampling requirements will be met and when representative samples of the workers’ breathing zones will be taken. For example, will air samples be taken during out-of-the-pool decontamination of the rack (in preparation for interim storage)?

Enclosure

6. Describe all the types of radiation surveys performed by HPTs and when they will be performed. For example, will the HPT: (1) check external radiation levels of, and contamination on, materials or equipment removed from the pool, and (2) survey equipment as it breaks the surface of the pool to detect unexpected sources of high radiation?

7. a. After completion of the rack installation project, does the licensee plan to store miscellaneous irradiated radioactive materials (MIRM) atop the rack? Examples of MIRM include activated portions of incore detectors/cabling, neutron start-up sources, or any other irradiated material that is usually stored underwater due to their high external radiation levels (e.g., greater than 5 rem/hour at 30 cm in air).

   b. If MIRM storage is allowed atop the fuel storage racks, describe the controls that would be established to limit the materials height above the fuel racks and the resultant external radiation level increases above and around the pool in the event of an inadvertent loss of pool water level (shielding).

8. Section 9.6, page 9-4 of the Holtec report describes the process of removing the rack and preparing it for storage. The decontaminating techniques discussed include rinsing with clean water, drip drying, and manually wiping the external surfaces.

   Discuss the criteria (smearable contamination and/or external radiation levels) in place that would require more robust forms of decontamination (e.g., high-pressure hydro-lazing) to maintain the rack at manageable levels of external radiation/contamination.

9. Discrete hot particles (fuel and/or activated corrosion and wear products) of sufficient activity to cause significant shallow-dose equivalent and whole body, deep dose exposures, can be present in SFPs (e.g., on fuel racks).

   a. Describe the survey program for identifying hot particles, minimizing their potential spread and, the measures that may be employed to ensure that workers decontaminating (wiping down) the rack for packaging and storage are protected from unexpected hot particle doses.

   b. Describe 10 CFR Part 19 worker training provided specific to rack installation including lessons learned by the contractor relative to past experience in SFP racking. Discuss whether this training will include the extremity dose hazards of improperly handling (e.g., picking up by hand) potential highly activated debris from the pool or during removal and preparation of the rack for storage. (For previous incidents of mishandling debris, see NRC Information Notice No. 90-47: "Unplanned Radiation Exposures to Personnel Extremities Due to Improper Handling of Potentially Highly Radioactive Sources.")

10. a. The submittal notes that use of divers is not anticipated during the proposed rack installation. However, in the event that divers are needed, describe the procedural controls to be implemented to ensure that divers maintain a safe distance from any high and very high radiation sources in the pool. Guidance

regarding procedural controls is provided in Regulatory Guide 8.38, “Control of Access to High and Very High Radiation Areas in Nuclear Power Plants,” Appendix A, “Procedures for Diving Operations in High and Very High Radiation Areas.”

b . Describe pre-pool-entry radiation surveys of the dive area and how FPL plans to monitor the divers’ doses (use of whole body and extremity dosimetry, remote readout (telemetry) radiation detectors, etc.).

11. The submittal described a methodology used to calculate the maximum effective multiplication factor (k_{eff}). The U.S. Nuclear Regulatory Commission (NRC) staff has outlined two acceptable methodologies to perform SFP criticality analyses in a memorandum entitled “Guidance on the Regulatory Requirements for Criticality Analysis of Fuel Storage at Light-Water Reactor Power Plants,” from L. Kopp to T. Collins dated August 19, 1998. The two methodologies are: (1) a worst-case combination with mechanical and material conditions set to maximize k_{eff}, or (2) a sensitivity study of the reactivity effects of the tolerance variations. The licensee’s amendment is unclear on which methodology was used.

    Identify the methodology that was employed to calculate the maximum k_{eff}.

12. The licensee calculated maximum effective multiplication factors by statistically combining all of the reactivity effects due to tolerances and uncertainties for the Turkey Point SFPs. However, the submittal does not contain the equations used to calculate these values.

    Provide the equations used to perform the maximum k_{eff} calculations and a detailed quantitative example demonstrating how the reactivity effects of each tolerance and uncertainty were calculated. The example should clearly and numerically demonstrate the methodology used to calculate the reactivity associated with each uncertainty or tolerance. Additionally, calculate the values presented in one of the reference cases of the amendment as the example. A detailed description of the statistical methods employed and the values used in the calculation of any statistical uncertainties should be included.

13. The NRC staff has performed an initial review of the submittal and has concerns regarding the current regulatory licensing basis for the Turkey Point SFPs. After reviewing recent amendments and the Updated Final Safety Analysis Report, the currently described licensing basis is unclear whether the design of the SFP complies with 10 CFR 50.68 or 10 CFR 70.24.

    Identify the current regulations and regulatory guidance that FPL considers its licensing basis for the SFPs. Additionally, describe how the proposed amendments will affect compliance with the regulations as described in 10 CFR 50.68 or 10 CFR 70.24. Finally, state how compliance with the regulations will continue if the proposed changes are approved.

14. The licensee’s amendment identifies Westinghouse 15 x 15 Optimized Fuel Assembly (OFA), Debris Resistant Fuel Assembly (DRFA) and low parasitic LOPAR spent and

fresh fuel assemblies as the fuel types the new cask area racks are designed to accommodate. Therefore, only these fuel types were considered in the criticality analysis. The licensee stated that the Westinghouse 15 x 15 OFA and DRFA (referred to as the Westinghouse 15 x 15 OFA/DRFA assembly in the amendment) assemblies provided the most limiting reactivity conditions and were used in the licensing basis criticality analyses.

Specify whether any other fuel types (other than Westinghouse 15 x 15 LOPAR) are currently stored in either of the Turkey Point SFPs. If additional fuel types are stored in the pools, demonstrate quantitatively that the Westinghouse 15 x 15 OFA/DRFA assemblies provide the most conservative criticality analyses.

15. The results of the criticality analysis appear to apply to only the fuel types currently stored in the Turkey Point SFP. How will new fuel types be incorporated into the existing analysis, or will a new analysis be required?

16. The licensee's criticality analysis has determined that the misloading of a fresh fuel assembly into the corner cell intended to be used to store the fuel handling tool requires 624 parts per million of soluble boron to assure the maximum k_{eff} does not exceed 0.95. The licensee stated that this misloading event provided the bounding criticality accident condition because the cell does not contain Boral panel inserts and was not intended to contain a fuel assembly.

    Identify the controls in place or planned to prevent misloading of a fresh fuel assembly into the corner cell.

17. Section 4.1 of the Holtec report states that an infinite radial array of fuel assemblies was assumed in the analysis "except for . . . certain abnormal/accident conditions where neutron leakage is inherent."

    Provide a table of all abnormal/accident events analyzed. The table should identify whether an infinite radial array was assumed for each event. Additionally, for events where an infinite radial array was not assumed, provide a justification for why it was not assumed, and what conservative assumptions, with accompanying justification, were made instead.

18. Section 4.5.4 of the Holtec report described the modeling of the inter-rack gap between cask area racks and Region 2 racks. The report stated, "These calculations are also valid for the rack-to-rack interaction between the cask area rack and the Region 1 racks as the Region 1 racks are licensed to the same regulatory limits as the Region 2 racks." Although the NRC staff agrees that the racks are licensed to the same regulatory limits, the licensee is permitted to store higher reactivity (i.e., fresh) fuel in the Region 1 racks. Therefore, it is reasonable to assume there may be greater interaction between Region 1 racks and the cask area rack than between the Region 2 racks and the cask area rack.

    Either provide a discussion regarding the interaction between the Region 2 racks and the cask area rack as the limiting interface condition or reanalyze the pool to consider the Region 1 interaction with the cask area rack.

19. Section 4.5.4 of the Holtec report described how the analysis of the inter-rack gap was performed. The report stated, “The reactivity of the inter-rack gap calculation was bounded by the maximum of the two infinite array calculations.”

    Provide a table listing the results of all the calculations performed to support this conclusion. Additionally, include a more detailed description of how the analysis was performed, specifying any assumptions used in the calculations, how the calculations were compared, and how the most limiting condition was identified.

20. Table 4.5.1 in the Holtec report presented the reactivity effects of the manufacturing tolerances considered in the criticality analysis.

    Does Table 4.5.1 comprise the complete list of all tolerances considered? If so, justify why tolerances on other parameters, such as those in Table 4.1.1, were not included. Provide detailed quantitative information to support the exclusion of any parameters from the calculation of the maximum effective multiplication factor. If exclusion of these parameters results in a nonconservative maximum effective multiplication factor, provide additional information describing the net maximum reactivity effect, how this effect was quantified, and how these parameters are either physically or administratively controlled to prevent changes in their reactivity effect in the future.

    If not, discuss whether the table should be amended to include all tolerances analyzed. This discussion should include a complete list of the tolerances.

21. Section 3.2 of the submittal presented a summary of the criticality analyses performed. The licensee stated “Because the cask area racks are essentially identical and Turkey Point fuel is of common design, a single criticality analysis was performed covering both units.”

    Provide a table summarizing the differences between the cask area racks, SFPs designs, currently installed spent fuel storage racks, and any other factors that will affect the criticality analysis. Additionally, for each difference identified, describe which condition was used in the criticality analyses, including a detailed justification for why it represented the most limiting condition.

22. Section 3.2 of the submittal states “Because the interaction analysis assumed a minimum 2-inch gap between the racks, the actual gap dimension will be verified to meet or exceed the minimum gap during installation of the cask area rack.” Figure 1.1.1 “Unit 3 Spent Fuel Pit Layout” shows a nominal rack spacing of 2.4 inches on the western edge of the new cask area rack. Additionally, Figure 1.1.2 “Unit 4 Spent Fuel Pit Layout” shows nominal rack spacings of 2.5 inches on the northern, southern, and western edges of the new cask area rack. The submittal also stated that the baseplates extend 1/4-inch beyond the rack module periphery wall and “act to center the rack in the cask area and establish the required minimum separation between the rack and the surrounding racks or wall.” This 1/4-inch spacing will not provide the 2-inch gap assumed in the analysis.

As the criticality analysis contains a limited gap margin (less than 0.5 inches) on multiple interfaces, describe all controls that will be used to ensure that the 2-inch margin assumed will be provided. If physical properties of the racks will provide the 2-inch gap, provide a figure depicting their location and how they will function to ensure the proper spacing.

23. Section 3.2 of the submittal states, "the rack cells employ Boral neutron absorber panels mounted on the outside faces of stainless steel boxes . . . (except cells on the rack periphery facing the east SFP wall, which contain no Boral panel on the outer face) . . . ." Since the cask area rack is not symmetrical with respect to neutron absorption properties, the proper orientation in the pool becomes crucial. The NRC staff has identified this event as a potential new accident for which the licensee has not performed a criticality analysis.

    As improper orientation of the rack could result in a higher accident k_{eff} than misloading a single fuel assembly, perform a criticality analysis of the effects of improperly orienting the cask pit rack within the SFP and then, subsequently, fully loading it with fresh fuel. Additionally, identify all rigorous controls that will be implemented to reduce the likelihood this accident will occur.

24. Experience shows that upon initial installation (i.e., contact with water) Boral™ releases hydrogen gas. The buildup of hydrogen gas has been known to cause bulging and deformation of the cells that form the fuel storage rack.

    What design features are in place on the proposed cask area spent fuel storage racks to liberate hydrogen gas from the rack cells?

25. Enclosure 1, Section 3.5 of the submittal states that:

    > Section 3.5 in Appendix 1 details the defense-in-depth approach taken to ensure that the handling of racks by the cask handling crane will comply with the NUREG-0612 guidance.

    However, the discussion in Section 3.5 of Appendix 1 is limited to the general guidance provided in Section 5.1.1 of NUREG-0612. Section 5.1.2 of NUREG-0612, "Spent Fuel Area - PWR [Pressurized-Water Reactor]," recommends that, in addition to satisfying the general guidelines of Section 5.1.1, one of the four criteria outlined in Section 5.1.2 should be met.

    Describe how the Spent Fuel Cask Handling Crane meets the guidelines of Section 5.1.2 of NUREG-0612.

26. Enclosure 1, Section 3.5 of the submittal states the following:

    > To ensure compliance with Technical Specification 3.9.7, spent nuclear fuel stored in existing racks adjacent to the cask area will be relocated prior to installing and removing the cask area rack. A physical survey of the respective cask area in relation to its door

> opening and cask crane travel path will determine which storage cells will be vacated of spent nuclear fuel.

Describe the criteria that were used to determine the cells to be vacated. Include whether this vacating of cells will ensure that the movement of the racks over or within 25 feet horizontal of the "hot" spent fuel will be prevented as recommended in Section 5.1.2(3)(b) of NUREG-0612.

27. Enclosure 2, page 3 of the submittal states:

> The probability and consequences of a heavy load drop of the cask area rack are bounded by the existing cask drop analyses. The consequences are not adversely affected because a fuel transfer cask is much heavier than the empty rack.

a. Discuss whether the dropping of the cask on the SFP liner was analyzed. If so, describe the results, and explain how you plan to limit consequences if the perforation of the liner occurs. If not, explain why this is not a credible event at Turkey Point.

b. Discuss the effect of dropping the cask on the pool structure.

28. Enclosure 1, Section 3.5 of the submittal states that:

> To prevent submerging the crane's main hook during rack installation and removal, a temporary hoist with the appropriate capacity will be attached to the main hook . . . .

Provide details regarding this temporary hoist. Explain how the hoist will be used, and what industrial standards it meets.

29. Standard Review Plan (SRP), Section 9.1.2.III.e states:

> Conventionally the plant's Technical Specification states that the weight of all loads being handled above stored spent fuel shall not exceed that of one fuel assembly and its associated handling tool. This weight and its normal carrying height above the storage racks establishes what was considered the upper bound on the potential energy available to damage the stored spent fuel if a load drop occurs. It has been subsequently noted that lighter loads handled at greater drop heights may have greater amounts of potential energy.

a. Explain whether the potential energy associated with the weight of loads being handled above stored fuel has been considered, given the likely occurrence of greater damage should such a load be dropped from a higher height than established.

b. Describe the presence of any control measures that would prevent this type of occurrence.

30. a. Describe the controls to prevent the inadvertent draining of the SFP water level below a height of approximately 10 feet above the top of active fuel in the event of a failure of inlets, outlets, piping, or drains (SRP Section 9.1.3).

    b. Explain how, for all planned offloads, the SFP water level is maintained. Assume a worst-case active component failure for SFP cooling.

31. a. Explain the means provided for mixing to produce a uniform SFP water temperature throughout the pool (SRP Section 9.1.3).

    b. Describe any local heat-up in the cask area.

    c. Discuss the adequacy of the thermal-hydraulic interaction between the SFP water and cask area.

32. Page 13 of the submittal provides the fuel assembly transfer rates for analysis involving two offload cases. The fuel assembly transfer rates are eight per hour and six per hour for Cases 1a and 1b, respectively.

    Explain the difference in these transfer rates and how the transfer rates will not be exceeded during actual offload operations.

33. Describe how the capability to remove fuel from the SFP will be assured with licensed fuel storage in the new cask area fuel storage rack.

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TURKEY POINT PLANT

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