Florida Power
CORPORATION
Crystal River Unit 3
Docket No. 50-302
Operating License No. DPR-72

October 26, 2000
3F1000-07

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: Clarifications and Corrections of Amendment No. 193 Safety Evaluation and License Amendment Request #239 - Enhanced Spent Fuel Storage (TAC No. MA6754)

References:
1. FPC to NRC letter, 3F0999-07, dated September 16, 1999, "License Amendment Request #239, Revision 0, Enhanced Spent Fuel Storage."
2. NRC to FPC letter, 3N0900-10, dated September 13, 2000, License Amendment No. 193, "Spent Fuel Pool Storage Capacity Increase."

Dear Sir:

By reference 1 Florida Power Corporation (FPC) submitted License Amendment Request (LAR) #239, requesting changes to the Crystal River Unit 3 (CR-3) operating license that would increase the licensed capacity of spent fuel assembly storage in the Spent Fuel Pool. Reference 2 is Amendment No. 193 to the CR-3 operating license which changed the license as requested by LAR #239. FPC has reviewed the safety evaluation (SE) accompanying Amendment No. 193 and has identified information requiring correction or clarification. Additionally, FPC has identified information in LAR # 239, Attachments D and H that require updating or correction. The clarifications to Amendment No. 193 SE are identified in Attachment 1 and the corrections to LAR #239 are identified in Attachment 2.

FPC considers that the LAR #239 revisions and the Amendment No. 193 SE clarifications do not change any of the conclusions regarding the acceptability of the proposed increase in spent fuel storage capacity. These corrections do not involve proprietary information.

There are no new regulatory commitments made in this submittal. If you have any questions regarding this submittal, please contact Mr. Sid Powell, Manager, Nuclear Licensing, at (352) 563-4883.

Sincerely,

T. H. Taylor
Director, Nuclear Engineering and Projects

A001

THT/rer

Attachments:

1. Clarifications of Amendment No. 193 Safety Evaluation
2. Corrections to License Amendment Request (LAR) #239 - Enhanced Spent Fuel Storage

xc: Regional Administrator, Region II
Senior Resident Inspector
NRR Project Manager

CLARIFICATIONS OF AMENDMENT NO. 193 SAFETY EVALUATION

The following are the points from the Amendment No. 193 safety evaluation (SE) for Florida Power Corporation (FPC) Crystal River Unit 3 (CR-3) that are being corrected and/or clarified.

1. Revision: In section 3.1.2, revise the stated thickness of the stainless steel box plates from 0.60-inch to 0.060-inch.

   The first paragraph, first sentence, refers to the neutron absorber in the Pool A racks being sandwiched between two 0.60-inch thick stainless steel boxes. In section 2.4 of the Holtec International criticality safety analysis for Pool A, submitted as Attachment E of LAR #239, the boron carbide is stated to be clad with 0.060-inch thick steel plates. (These plates form the "box" or fuel assembly storage cell.)

2. Revision: In section 3.1.3, change the number of fuel assemblies required for storage in peripheral cells of Pool B from six to eight.

   The last sentence in the fourth paragraph notes that six fuel assemblies must be administratively restricted to the peripheral cells in Pool B. However, there are eight fuel assemblies that must be restricted to the Pool B peripheral cells.

3. Revision: In section 3.2, revise the reference to 29.6 $x10^6$ Btu/hr.

   The first sentence in the second paragraph refers to the heat load of 29.6 $x10^6$ Btu/hr as the "full-core discharge heat load." License Amendment Request (LAR) #239, Section 2.0 of Attachments D and H, indicated the heat load from the off-loaded full-core would be 26.6 $x10^6$ Btu/hr, and the heat load from the balance of assemblies in the pool would be 3.0 $x10^6$ Btu/hr. The combination of these two results in a total pool heat load of 29.6 $x10^6$ Btu/hr. Thus, it would be most accurate to describe the 29.6 $x10^6$ Btu/hr as the "total pool heat load including a full-core discharge."

4. Revision: Two points of clarification in section 3.2 related to specified time are needed.
   1) Revise "165 hours" to "156 hours."

      The first sentence in the fifth paragraph of section 3.2 refers to 165 hours as a minimum time for holding the fuel assemblies in the reactor after shutdown. LAR #239, Section 2.1, of Attachments D and H, indicated 156 hours as an assumed cooling period after reactor shutdown and the time after a full-core off-load when two trains of spent fuel cooling can maintain the pool below 160°F. The SE also reflects a discussion of the systems available for pool cooling from Final Safety Analysis Report (FSAR) section 9.3.2.1.1, but states, incorrectly, 165 hours as the time after reactor shutdown with two trains of spent fuel pool (SFP) cooling available. FSAR section 9.3.2.1.1 reflects this time as 156 hours after reactor shutdown.

   2) Revise the statement that "plant refueling procedures require fuel assemblies must be held in the reactor for a minimum period of time (165 hours)." FPC considers it more appropriate to refer to the time period (156 versus 165 hours) as an assumed cooling period before the fuel assemblies are located in the spent fuel pool.

      Reiterating item 1) above, the first sentence in the fifth paragraph of section 3.2 refers to 165 hours as a minimum time for holding the fuel assemblies in the reactor after shutdown. LAR #239, Section 2.1, Attachment D, referred to 156 hours as part of a statement that "a cooling period of 156 hours is assumed after reactor shutdown." This

156 hours was determined in heat load analyses as the earliest time after reactor shutdown that the fuel pool temperature can be maintained below 160°F with a full-core off-load. CR-3 refueling procedure specifies 150 hours as the period of time that the reactor must be subcritical prior to movement of irradiated fuel. The 150 hour and 156 hour periods are discussed further in FSAR Section 9.3.2.7 as follows:

> "The 150 hour time between reactor shutdown and the start of a full-core off-load to the Spent Fuel Pool discussed above and the 156 hour time before sole reliance can be placed on the Spent Fuel Cooling system are based on limiting parameters. If actual conditions are less restrictive fuel transfer may begin sooner and isolation from the decay heat removal system may begin sooner. An engineering evaluation will be required to determine the specific time interval."

5. Revision: In section 3.4.1, change the number of racks used in the Multiple Rack (MR) analysis from "ten" to "eight."
   The first sentence of the sixth paragraph states that ten freestanding racks were considered in the 3-D MR analysis. LAR #239, Attachment D, Figure 3-19 reflects eight racks as being used in the whole pool finite element model.

6. Revision: In regard to section 3.5, the following discussion of routine monitoring of areas and posting of increases in dose rate is provided for clarification.
   The third paragraph discusses the estimated increase in dose rates in areas adjacent to the pool during full-core off-load with the increased storage capacity. The last sentence states: "The licensee will monitor these areas routinely and will post any dose rate increases resulting from increased fuel storage." It should be recognized that this is not a new commitment to monitor these areas and to post small increases in dose rate. As reflected in FPC letter 3F0600-13, dated June 29, 2000 (Attachment B, Request 1 response), CR-3 monitors these areas of the Auxiliary Building in accordance with existing procedures as a routine function of the Radiological Protection Department, with follow-up action being to evaluate measures to reduce the dose rate and to take appropriate actions. In the event storage of spent fuel in the higher density racks did result in increased dose rates, FPC would post such increases as required in accordance with existing procedures.

7. Revision: In section 3.7.2, change "minimum height of 6 inches above the pool liner" to "within 6 inches above the pool liner" as the height above the pool liner for moving the racks.
   The third sentence in paragraph 1 states that the racks will be lowered into the pool to a "minimum height of 6 inches above the pool liner..." The 6 inches is understood to be the highest lift of the racks above the pool liner. FPC proposes that it would be clearer to describe this height restriction in terms of "within 6 inches above the pool liner." This is consistent with a statement later in that same paragraph: "Movement of the racks along the SFP floor shall not exceed 6 inches above the floor."

8. Revision: In section 7.0, add FPC letter dated June 29, 2000 as a reference.
   Information submitted by FPC in letter dated June 29, 2000 was used in the safety evaluation. Thus, FPC considers it appropriate to add this letter as a reference.

CORRECTIONS TO LICENSE AMENDMENT REQUEST (LAR) #239 ENHANCED SPENT FUEL STORAGE

The following are the corrections to Florida Power Corporation (FPC) LAR #239 Attachment D, "Engineering Input (Proprietary)," and Attachment H, "Engineering Input (Non-Proprietary)." The references to sections are applicable to both attachments. These corrections do not involve any proprietary information.

1. Section 2.1, "Decay Heat Calculations for Spent Fuel," second paragraph (page 2-1)

   Revision

   The design cooling water temperature of 95°F identified as the basis for calculated spent fuel pool temperature is incorrect. Section 2.1, paragraph 2, states: "Calculated pool temperatures are based on the design cooling water temperature of 95°F for the Nuclear Services Closed Cycle Cooling System." The Nuclear Services Closed Cycle Cooling System (SW) provides cooling of the spent fuel pool. The calculation referenced in this paragraph as the decay heat load calculations (Reference 7.11.l) used a temperature of 100°F for the SW under the assumed conditions of a full spent fuel pool plus a full-core off-load (total heat load to the pool of 29.6 x 10^6 Btu/hr), with two trains of spent fuel pool cooling in service.

   Reason

   This error is due to oversight by the individuals who prepared and reviewed LAR #239.

2. Section 3.3.2.4.1, "Functional Capability of the Fuel Racks," last paragraph (page 3-3)

   Revision

   The second sentence states that the plastic deformation is between 1.9 and 6.0 inches for the eight cases evaluated. (The eight cases referred to are different scenarios of dropping a fuel assembly onto the top of the spent fuel storage racks, referred to as Orientations A and B.) It has now been determined that the smallest plastic deformation for the eight cases evaluated would be 1.7 inches. No change is made to the maximum deformation of 6.0 inches.

   Reason

   The reduction in the smallest deformation from 1.9 inches to 1.7 inches is a result of using a revised minimum yield strength that is based on the actual material properties.

3. Section 3.3.2.4.2, "Functional Integrity of Spent Fuel Pool Structure and Liner," second paragraph (page 3-4)

   Revision

   The bearing load on the spent fuel pool stainless steel liner for Orientation C fuel assembly drop has decreased from the stated value of 506 kips to 125 kips, while the allowable bearing load has decreased from the stated value of 688 kips to 687 kips. The punching load on the concrete has likewise decreased from the stated value of 506 kips to 125 kips, while the allowable load for punching shear has decreased from the stated value of 2,322 kips to 290 kips.

Reason

The values of the actual impact loads decreased as a result of considering the deformation of the fuel assembly. The original dropped fuel assembly analysis (i.e., the analysis used for the initial license amendment request) did not consider energy absorption due to deformation of the fuel assembly. However, a large fraction of the kinetic energy is absorbed by such deformation.

The scope of the original analysis was limited to the direct effects on the rack and the local effects on the pool floor under the rack for an infinite slab. The original dropped fuel assembly analysis did not consider punching at the corner of the concrete slab, where the shear resisting area is substantially reduced. This represents a change in the conditions that were evaluated for the fuel assembly drop but does not affect the conclusion of the analysis that the integrity of the spent fuel pool liner will be maintained. The allowable load value used for the dropped fuel assembly has been revised to be consistent with the more conservative pool floor load limit used for the corner loading.

4. Table 3-1, "Fuel Assembly Drop Scenario Results" (page 3-16)

Revision

- Drop Orientations A and B: Impact Velocity increased from 96 in./sec. to 127 in./sec., and the Kinetic Energy increased from 2,733 lb.-ft to 4,762 lb.-ft.
- Drop Orientation C: Impact Velocity increased from 268 in./sec. to 328 in./sec., and the Kinetic Energy increased from 21,300 lb.-ft to 31,905 lb.-ft.

Reason

The original impact velocities for dropped fuel assembly Orientations A, B, and C were calculated using an assumed drag force acting on the fuel assembly as it drops through the water. This drag force resulted in impact velocities that were lower than would now be expected. The impact velocities changed based on a revised drag force derived from actual tests of dropped fuel assemblies performed by Westinghouse. The mechanical characteristics of the Westinghouse fuel assemblies dropped in the tests were compared to a Framatome design fuel assembly to demonstrate the applicability of the test results. An analytical method to determine the drop velocity of a fuel assembly was developed based on the data obtained from the tests. The impact velocities calculated using this method are higher than the impact velocities calculated in the original fuel drop analysis. The increased kinetic energies are a direct result of the higher velocities. The increased velocities and kinetic energies for the three orientations are acceptable based on the smaller value of deformation for Orientations A and B discussed in revised Section 3.3.2.4.1 and the lower value of impact loads for Orientation C discussed in revised Section 3.3.2.4.2.

5. Section 7.11, "References" (page 7-4)

Revision

The titles for References 7.11.l and 7.11.m are incorrect. Reference 7.11.l should be: *FPC Calculation M96-0014, R1, "Spent Fuel Pool Heat Load and Heat Exchanger Performance at Reduced SW Flow"*, and Reference 7.11.m should be: *FPC Calculation F97-0014, R1, "Spent Fuel Pool Temperature Rise From Fuel in the Pool."*

Reason

This error is due to oversight by the individuals who prepared and reviewed LAR #239.