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

June 29, 2000
3F0600-13

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

Subject: Response to NRC Requests for Additional Information Regarding Enhanced Spent Fuel Storage Amendment (TAC No. MA6754)

References:
1. NRC to FPC letter dated May 10, 2000
2. NRC to FPC letter dated May 24, 2000

Dear Sir:

This letter submits Florida Power Corporation (FPC) responses to the two requests for additional information regarding License Amendment Request (LAR) #239 forwarded by the referenced letters. LAR #239 requested license changes that would increase the spent fuel storage capacity at Crystal River Unit 3.

There are no new regulatory commitments in this submittal.

If you have any questions regarding this matter please contact Mr. Sid Powell, Manager, Nuclear Licensing, at (352) 563-4883.

Sincerely,

T. H. Taylor
Director, Nuclear Engineering and Projects

THT/rer

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

Attachments:

A. Response to NRC Request for Additional Information dated May 10, 2000
B. Response to NRC Request for Additional Information dated May 24, 2000

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FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302/LICENSE NO. DPR-72

ATTACHMENT A

LICENSE AMENDMENT REQUEST #239, REVISION 0

Enhanced Spent Fuel Storage

Response to NRC Request for Additional Information

Dated May 10, 2000

1. **NRC Request**

In accordance with recommendations provided in NUREG-0612, Section 5.1, discuss the potential for accidental dropping of a postulated vertical rack drop onto another rack and onto the spent fuel pool (SFP) floor from the maximum lift height of the rack. Address using the heaviest rack to be lifted over or in proximity to SFP A and B. Discuss how the potential rack drop and consequences are managed in order to preclude SFP water leakage that could uncover fuel in the pool. Address the potential damage to the SFP liner and concrete slab, and any leakage of SFP inventory beyond the SFP liner. Discuss the capability to manage the leakage including the capability to isolate the leakage and /or provide makeup to the SFP, the leakage rate, sources of makeup, and the makeup rate. Also address the potential impact of a rack drop on maintaining specified criticality factors.

FPC Response:

The potential for accidental dropping of a spent fuel rack is minimized by controls imposed through plant programs and procedures. This potential is further minimized by the substantial margins of safety between lifting device ratings and loads lifted, and compliance with recognized standards for equipment design, e.g. NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," and ANSI N14.6, "Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or More," as appropriate. [Crystal River Unit 3 (CR-3) compliance with the recommendations of NUREG-0612, Section 5.1, is described in docketed submittals.]

A 20-ton hoist will be attached to the Auxiliary Building Overhead Crane. This combination will be used to raise the new spent fuel racks to the operating floor of the Auxiliary Building, remove the existing racks from SFP B and the Auxiliary Building, and lower the new racks into SFP B. The Auxiliary Building Overhead Crane has a load rating of 72 tons. The qualifications of this crane and the 20-ton hoist are discussed in the response to question number 2.

An analysis was performed in accordance with NUREG-0612 to determine the consequences of a load drop into SFP B. (Racks will not be moved over SFP A) The heaviest load to be lifted as part of the rack replacement project is a rack currently in SFP B with a weight of 17,715 pounds. The combined weight of this rack and the lifting rig is less than 20,000 pounds. The load drop analysis was performed using a bounding load of 20,000 pounds, assumed to be dropped from the highest lift point of six inches above the spent fuel pool operating deck to the pool floor.

The worst case load drop is a rack dropping directly to the spent fuel pool floor without first contacting the pool walls, with the rack rotated to a position where its center of gravity is directly over one of its corner support pads. In this position all of the impact energy is transmitted through a single pad contacting the floor. This results in puncturing the 3/16-inch stainless steel liner and penetrating the 5-foot thick concrete floor slab below the liner to a depth of less than 6 inches. No damage, e.g. scabbing, would occur on the underside of the concrete floor slab. The upper portion of the concrete floor slab is under compression. This compressive loading prevents the initiation and propagation of a crack through the entire thickness of the 5-foot thick slab. No loss in the structural integrity of SFP B would occur due to the dropped rack.

The consequences of dropping a rack directly onto the SFP floor bound the consequences of dropping one rack onto another since the force would be absorbed by the impacted rack and distributed among all of its support pads. The drop of one rack directly onto another containing spent fuel was not analyzed because this will be effectively precluded by not allowing racks to be

moved over racks containing spent fuel. Precluding the drop of one rack onto another containing spent fuel ensures that specified criticality factors are maintained.

The walls and floor of the spent fuel pool are 5-foot thick reinforced concrete. The seams between all sections of concrete are sealed and a waterproof sealant applied to the inside surfaces of the concrete. The floor and walls of the CR-3 SFP have a system of leak chases at the welded joints of the stainless steel liner panels. The leak chase trenches collect liner leakage and drain by gravity to a leak test hopper/funnel. Isolation valves are provided in each drain line from the leak chase trenches to the hopper. These valves will be maintained closed during rack movements, thereby precluding excessive leakage that might occur following a load drop. The only non-isolable leakage from the spent fuel pool would be a slow migration of the water from the site of the puncture. The rate of this leakage would be limited by the low permeability of the concrete to a negligible value.

CR-3 has various sources of make-up to the SFP as discussed in FSAR Section 9.3.2.8, "Makeup Capability." The sources identified are the Decay Heat (DH) System, the Demineralized Water Supply System, and temporary fire hoses. Based on the isolation valves being maintained closed, the negligible leakage rate through the concrete, and the various sources of make-up, the make-up capability exceeds any leakage resulting from a rack drop. Therefore, uncovery of the fuel stored in the SFP B is precluded.

2. NRC Request

The License Amendment Request stated that the existing Auxiliary Building overhead crane will be used to lift the rack from the auxiliary building bay and up through the equipment hatch. Once the rack module is on the operating floor, a 20-ton hoist will be coupled to the hook of the overhead crane and used to move the spent fuel storage racks. Also special lifting and rigging devices will be used to remotely move and lower the spent fuel storage rack modules into position.

Discuss the qualifications of both the auxiliary building overhead crane and the 20-ton hoist, including design and testing, to lift the racks over the SFP. Discuss the safe load path for moving the racks to the SFP. Describe all the special lifting and rigging devices used to handle the spent fuel storage rack modules including testing criteria used to verify the reliability of the devices, and cite the source of the criteria.

FPC Response

Qualifications of Auxiliary Building Overhead Crane

The Auxiliary Building Overhead Crane is rated at 72 tons. The heaviest load to be lifted during rack replacement weighs less than 20,000 pounds (ten tons), consisting of a rack currently in Spent Fuel Pool (SFP) B plus the lifting rig. This provides a factor of approximately seven for the margin of safety. This substantial margin of safety minimizes the potential for dropping a load as a result of crane failure. The potential for a load drop is further minimized by designing, inspecting, and load testing the crane and all lifting devices in accordance with the guidelines of various documents, including NUREG-0612, ANSI N14.6 ("Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or More") and ANSI B30.9 ("Slings").

Qualifications of 20-Ton Hoist

An electric powered commercial grade hoist with a minimum capacity of 20 tons will be attached to the Auxiliary Building Overhead Crane. The hoist complies with ASME/ANSI B30.16, "Overhead Hoists (Underhung)," which requires a maximum design stress of 20% of ultimate material strength for load bearing parts. Based on the heaviest load of approximately 20,000 pounds (10 tons), the minimum 20-ton capacity hoist provides double the normal stress design factor, including dynamic load factor, for handling heavy loads as required by Section 5.1.2 of NUREG-0612. The hoist is load tested to 3 times the heaviest load to be lifted (plus a dynamic load factor) and inspected in accordance with the requirements for special lifting and handling equipment as described in ANSI N14.6.

Safe Load Paths

Existing administrative controls require that safe load paths be used for movement of heavy loads by the Auxiliary Building Overhead Crane. The existing procedure for operation of the Auxiliary Building Overhead Crane currently defines a safe load path for moving a spent fuel shipping cask in accordance with NUREG-0612, Phase I. The safe load path across the spent fuel pool operating deck is from the equipment hatch near the south end of the floor, to the cask decontamination pit and to the cask loading pit in the southeast corner of SFP B. Since the weight of the cask is greater than the weight of the rack this load path may be used for the racks. Movement of the racks over SFP A is not needed and will not be done.

The rack replacement plan will control the lifting of the racks into or out of SFP B to minimize any potential for dropping of one rack onto another containing spent fuel. The plan will ensure that racks are not moved over spent fuel. The safe load path and installation procedures will maximize the distance between the rack being moved and any rack in SFP B containing spent fuel. Racks will be lifted from and inserted into SFP B with either an empty rack or the equivalent size space between the rack being moved and any rack containing spent fuel.

Spent fuel storage rack lift height will be controlled throughout the removal and installation evolution. During rack movement across the spent fuel pool operating deck (162' elevation Auxiliary Building) the lift height of the racks will be minimized while maintaining the ability to clear potential obstacles on the floor, such as missile shields. When a rack is near SFP B, such that the rack could fall into SFP B if dropped, the height of the rack will be maintained less than 6 inches above the operating deck. This is consistent with the load drop analysis, which analyzed a rack drop from a height of 6 inches above the operating floor to the bottom of SFP B. Movement of a rack after it is lowered into SFP B will be performed with the rack positioned to within approximately 6 inches of the pool floor. This will minimize the drop distance and the "topple" potential of the rack, thereby minimizing the impact and damage to another rack or to the pool floor.

Special Lifting and Rigging Devices

A lifting rig, attached to the minimum 20 ton hoist through a load cell, will be used to remove and install the racks in SFP B. The lifting rig includes a spreader lifting frame and four lift rod assemblies that engage the rack at four lift points. The lifting rig is designed in accordance with NUREG-0612 and ANSI N14.6 for special lifting devices. The design of the lifting rig provides double the normal stress design factor, including dynamic load factor, for handling the critical loads as required by Section 5.1.2 of NUREG-0612. The lifting rig is load tested to 3 times the heaviest load to be lifted (plus a dynamic load factor) and inspected in accordance with the requirements for special lifting and handling equipment as described in ANSI N14.6.

3. **NRC Request**

How will the new racks affect future cask handling operations?

FPC Response

The replacement of the spent fuel storage racks will not impact the ability to conduct future cask handling and loading. Racks will not be installed in the cask-loading pit. The new racks will not preclude the ability to transfer spent fuel assemblies to the cask-loading pit for subsequent loading into shipping casks.

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302/LICENSE NO. DPR-72

ATTACHMENT B

LICENSE AMENDMENT REQUEST #239, REVISION 0

Enhanced Spent Fuel Storage

Response to NRC Request for Additional Information

Dated May 24, 2000

1. **NRC Request**

Please discuss how the increased number of fuel assemblies stored in Crystal River 3 (CR-3), Spent Fuel Pool (SFP) will affect the dose rates adjacent to the SFP B walls, including any accessible areas below the SFP. State whether the storage of an increased number of spent fuel assemblies in the SFP will necessitate any radiation zoning changes to any of the surrounding areas.

FPC Response

The increased number of fuel assemblies to be stored in SFP B will not result in a significant increase in dose rates adjacent to or below the pool, and thus will not require any changes to radiation zones or posting.

Dose rates in areas adjacent to or below the pool depend solely on the number of assemblies and the extent of decay of the fuel in the immediate vicinity of the measured dose point. Increases in dose rates from fuel located behind the peripheral rows of the racks, or fuel located well to the side of the measured dose point would be negligible due to the shielding provided by the fuel and the concrete pool walls or floor. Additionally, the dose rate from fuel that has decayed for years is much less than the dose rate from a batch of freshly discharged fuel. Therefore, the maximum possible dose rate, which would be near a batch of freshly discharged fuel, is unaffected by the total number of assemblies in the pool.

Two aspects of the new racks that could affect the dose rates outside the pool from the stored fuel are a slight decrease in the distance between the racks and the pool walls and a slight decrease in the distance between fuel assemblies. The combined effect of these two changes is estimated to be an increase in dose rates by a factor of two or less. The current design basis for the spent fuel pool is that the dose rate in areas adjacent to the pool would be less than 2 mR/hr from sources in the pool. An increase to 4 mR/hr would not affect the radiological postings in the area and would not be a radiological concern. The maximum potential dose rates would be at locations near a batch of freshly discharged fuel, which would decay rapidly with time.

Routine surveys in these areas of the Auxiliary Building are performed as part of the normal Radiological Protection Department function in accordance with existing administrative controls. Significant increases in the dose rate in these areas are not expected to occur during or after the rack replacement. If such increases did occur, measures to reduce the dose rate would be evaluated and appropriate actions taken as necessary.

As stated in License Amendment Request #239, Attachment D, Section 6.3.2, item g, the radiation zone designation of areas around the sides of the pools will not change due to rack replacement. The basis for this conclusion was stated to be the adequate shielding provided by the concrete walls and the minimum water depth above the stored fuel.

2. **NRC Request**

Discuss plans to use a vacuum to remove any crud or other debris from the floor of the SFP before and during the SFP reracking project.

FPC Response

Pre-work activities to remove seven light brackets from SFP B walls have been completed. A cutting process was used to remove the light brackets, resulting in generation of a small amount of debris. This debris fell onto an underwater platform. The platform was vacuumed after the cutting process, thereby preventing the debris from falling to SFP B floor.

The plans for the actual rack replacement include provisions for vacuuming the SFP B floor as needed. The actual amount of vacuuming needed will be determined while the rack replacement activity is in progress. An existing procedure specifies radiological controls for use of the underwater vacuum that minimize or eliminate the potential for radiological incidents, and prevent uncontrolled or undetected high radiation levels, loose surface contamination, and airborne radioactivity. FPC continues to research industry operating experience to identify best practices for vacuuming.

It should be noted that the existing racks, installed in 1991, are freestanding. Consequently, their removal will not require any cutting or grinding that would produce debris.

3. **NRC Request**

The reracking of the SFP will result in an estimated additional 30 cubic feet of solid radioactive waste materials (resins, filters, debris) to be generated by the SFP cleanup system, pool vacuuming, and equipment removal during the rack replacement process. Provide the fraction that the additional 30 cubic feet represents of the total solid radioactive wastes generated annually.

FPC Response

The additional 30 cubic feet of solid waste material is less than 1% of the annual solid waste volume generated during either 1998 or 1999, based on the volumes of solid waste shipped offsite reported in the CR-3 Radioactive Effluent Release Reports for 1998 and 1999. The 30 cubic feet is less than 1% of the annual solid waste stream projected to be generated in 2001, the year the rack replacement is to be accomplished.

4. **NRC Request**

In the submittal, an estimate for total dose for the SFP reracking operation of 15 person-rem was provided. Provide a dose breakdown, by job, to show how this dose estimate was derived. (If divers are used, include the estimated doses to divers.)

FPC Response

The pre-work activities in the SFP consisted of moving spent fuel, cutting seven light brackets from the SFP walls (using divers), modifying the lights in the SFP, and support activities. These activities resulted in 0.200 person-rem, which consisted of 0.162 person-rem from moving the spent fuel in support of the light bracket removal, and 0.038 person-rem for the diving activities related to cutting operations.

The license amendment request stated that personnel exposure is expected to be no greater than 15 person-rem. Through benchmarking at other facilities and by better defining the stay time and expected dose rates, FPC has revised the exposure estimate to be approximately 3.0 person-rem. (3.0 person-rem is an estimate that may change if radiological conditions are different from expected and is not intended as an exposure upper limit.) No dive operations are currently planned for the actual rack replacement.

The below table presents the major phases of the work and resulting dose estimate for each phase.

Work Phase	**Projected Dose (Person-REM)**
Pre-work (remove light brackets to eliminate interference)	0.200 (Actual)
Move/relocate the fuel assemblies within the pool (to empty the racks and allow rack removal from the pool)	0.20
Removal of the existing racks, decontamination, storage, and shipping off-site	2.3
Installation of the new racks	0.30
Total:	**3.0**