November 24, 2004

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 UNITS 3 AND 4 - ISSUANCE OF AMENDMENTS REGARDING TEMPORARY SPENT FUEL POOL CASK RACKS (TAC NOS. MB6909 AND MB6910)

Dear Mr. Stall:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 226 to Renewed Facility Operating License No. DPR-31 and Amendment No. 222 to Renewed Facility Operating License No. DPR-41 for the Turkey Point (TP) Plant, Units 3 and 4, respectively. These amendments consist of changes to the Technical Specifications in response to your application dated November 26, 2002, as supplemented by letters dated September 8, 2003, October 30, 2003, June 21, 2004, and October 8, 2004.

These amendments allow the licensee to revise Technical Specification Section 5.6, "Design Features - Fuel Storage," for TP Units 3 and 4 to include the design of a new cask pit spent fuel storage rack for each unit, and increase each unit's spent fuel storage capacity by combining the cask pit rack and existing spent fuel pool (SFP) storage rack capacities. The cask pit racks will be used to store spent fuel to allow refueling outage fuel offloads and nonoutage fuel shuffles. Additionally, these amendments will change the licensing basis of the TP SFPs from Title 10 of the *Code of Federal Regulations* (10 CFR) Section 70.24 to 10 CFR 50.68 compliance. In order to maintain the assumptions in the SFP criticality analysis and the capability to offload spent fuel to a transfer cask, the use of the cask pit racks is subject to the following conditions:

1. The licensee shall restrict the combined number of fuel assemblies loaded in the existing spent fuel pool storage racks and cask pit rack to no more than the capacity of the spent fuel pool storage racks. This condition applies at all times, except during activities associated with a reactor core offload/reload refueling condition. This restriction will ensure the capability to unload and remove the cask pit rack when cask loading operations are necessary.

2. The licensee shall establish two hold points within the rack installation procedure to ensure proper orientation of the cask rack in each unit's spent fuel pool. Verification of proper cask pit rack orientation will be implemented by an authorized Quality Control inspector during installation of the racks to ensure consistency with associated spent fuel pool criticality analysis assumptions.

A copy of the Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

/RA Brendan Moroney for/

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

Enclosures:
1. Amendment No. 226 to DPR-31
2. Amendment No. 222 to DPR-41
3. Safety Evaluation

cc w/enclosures: See next page

A copy of the Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

/RA Brendan Moroney for/

Eva A. Brown, Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
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Docket Nos. 50-250 and 50-251

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cc w/enclosures: See next page

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FLORIDA POWER AND LIGHT COMPANY

DOCKET NO. 50-250

TURKEY POINT PLANT UNIT NO. 3

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 226
Renewed License No. DPR-31

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Florida Power and Light Company (the licensee) dated November 26, 2002, as supplemented by letters dated September 8, 2003, October 30, 2003, June 21, 2004, and October 8, 2004, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Operating License and Technical Specifications as indicated in the attachment to this license amendment, and paragraph 3.B of Renewed Facility Operating License No. DPR-31 is hereby amended to read as follows:

   (B) Technical Specifications and Environmental Protection Plan

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 226, are hereby incorporated in the license. The Environmental Protection Plan contained in Appendix B is hereby incorporated into the license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. The use of the cask pit rack is subject to the following conditions:

   The licensee shall restrict the combined number of fuel assemblies loaded in the existing spent fuel pool storage racks and cask pit rack to no more than the capacity of the spent fuel pool storage racks. This condition applies at all times, except during activities associated with a reactor core offload/reload refueling condition. This restriction will ensure the capability to unload and remove the cask pit rack when cask loading operations are necessary.

   The licensee shall establish two hold points within the rack installation procedure to ensure proper orientation of the cask rack in each unit's spent fuel pool. Verification of proper cask pit rack orientation will be implemented by an authorized Quality Control inspector during installation of the racks to ensure consistency with associated spent fuel pool criticality analysis assumptions.

4. This license amendment is effective as of its date of issuance and shall be implemented within 60 days.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Michael L. Marshall, Jr., Chief, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications and Operating License

Date of Issuance: November 24, 2004

FLORIDA POWER AND LIGHT COMPANY

DOCKET NO. 50-251

TURKEY POINT PLANT UNIT NO. 4

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 222
Renewed License No. DPR-41

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Florida Power and Light Company (the licensee) dated November 26, 2002, as supplemented by letters dated September 8, 2003, October 30, 2003, June 21, 2004, and October 8, 2004, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Operating License and Technical Specifications as indicated in the attachment to this license amendment, and paragraph 3.B of Renewed Facility Operating License No. DPR-41 is hereby amended to read as follows:

   2. Technical Specifications and Environmental Protection Plan

      The Technical Specifications contained in Appendix A, as revised through Amendment No. 222, are hereby incorporated in the license. The Environmental Protection Plan contained in Appendix B is hereby incorporated into the license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. The use of the cask pit rack is subject to the following conditions:

   The licensee shall restrict the combined number of fuel assemblies loaded in the existing spent fuel pool storage racks and cask pit rack to no more than the capacity of the spent fuel pool storage racks. This condition applies at all times, except during activities associated with a reactor core offload/reload refueling condition. This restriction will ensure the capability to unload and remove the cask pit rack when cask loading operations are necessary.

   The licensee shall establish two hold points within the rack installation procedure to ensure proper orientation of the cask rack in each unit's spent fuel pool. Verification of proper cask pit rack orientation will be implemented by an authorized Quality Control inspector during installation of the racks to ensure consistency with associated spent fuel pool criticality analysis assumptions.

4. This license amendment is effective as of its date of issuance and shall be implemented within 60 days.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Michael L. Marshall, Jr., Chief, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications and Operating License

Date of Issuance: November 24, 2004

ATTACHMENT TO LICENSE AMENDMENT

AMENDMENT NO. 226 RENEWED FACILITY OPERATING LICENSE NO. DPR-31

AMENDMENT NO. 222 RENEWED FACILITY OPERATING LICENSE NO. DPR-41

DOCKET NOS. 50-250 AND 50-251

Replace pages 4 and 5 of Operating License No. DPR-31 and Operating License No. DPR-41 with the attached pages.

Replace the following pages of the Appendix A Technical Specifications with the attached pages. The revised pages are identified by amendment number and contain marginal lines indicating the area of change.

Remove pages	Insert pages
5-5	5-5
5-6	5-6

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 226 TO

RENEWED FACILITY OPERATING LICENSE NO. DPR-31 AND

AMENDMENT NO. 222 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-41

FLORIDA POWER AND LIGHT COMPANY

TURKEY POINT UNIT NOS. 3 AND 4

DOCKET NOS. 50-250 AND 50-251

1.0 INTRODUCTION

By application dated November 26, 2002, as supplemented by letters dated September 8, 2003, October 30, 2003, June 21, 2004, and October 8, 2004, the Florida Power and Light (FPL, the licensee) proposed an amendment to the Technical Specifications (TSs) for Turkey Point Plant (TP), Units 3 and 4. The requested changes would revise Technical Specification Section 5.6, Design Features - Fuel Storage, for TP Units 3 and 4 to include the design of a new cask pit spent fuel storage rack for each unit, and increase each unit's spent fuel storage capacity by combining the cask pit rack and existing spent fuel pool (SFP) storage rack capacities. The cask pit racks will be used to store spent fuel to allow refueling outage fuel offloads and nonoutage fuel shuffles.

The TP TSs currently permit the licensee to store 1404 fuel assemblies in each SFP. To accomplish this, the licensee currently employs high-density storage racks containing Boraflex inserts for criticality control. The licensee's amendment request proposes to add a new storage rack to each plant's SFP to accommodate the underwater loading of spent fuel casks for subsequent dry storage. The licensee's proposed storage racks will be used to temporarily increase the storage capacity of the SFP during refueling outage fuel offloads and nonoutage fuel shuffles. The rack will be removable to permit loading of dry storage casks. Additionally, this amendment will change the licensing basis of the TP SFPs from Title 10 of the *Code of Federal Regulations* (10 CFR) Section 70.24 to 10 CFR 50.68 compliance.

The supplements dated September 8, 2003, October 30, 2003, June 21, 2004, and October 8, 2004 provided clarifying information that did not change the initial proposed no significant hazards consideration determination.

2.0 REGULATORY EVALUATION

Section 50.68 of 10 CFR Part 50, Criticality accident requirements, provides the U.S. Nuclear Regulatory Commission (NRC) requirements for maintaining subcritical conditions in SFPs. Section 70.24 of 10 CFR Part 70 requires licensees to install criticality monitoring equipment

capable of detecting criticality and alerting plant personnel. Alternatively, licensees may comply with the regulatory requirements of 10 CFR 50.68 in lieu of maintaining a criticality monitoring system. In the submittal the licensee stated that this amendment would change the licensing basis of the TP SFPs from 10 CFR 70.24 to 10 CFR 50.68 compliance. As such, the NRC staff reviewed the licensee's compliance with all the requirements of 10 CFR 50.68. The 10 CFR 50.68 acceptance criteria for prevention of criticality in the SFP that are applicable to the addition of cask pit racks are the following:

(A) the effective multiplication factor (k_{eff}) shall be less than 1.0 if fully flooded with unborated water, which includes an allowance for uncertainties at a 95 percent probability, 95 percent confidence (95/95) level; and

(B) k_{eff} shall be less than or equal to 0.95 if fully flooded with borated water, which includes an allowance for uncertainties at a 95/95 level.

The NRC defined acceptable methodologies for performing SFP criticality analyses in three documents:

1. NUREG-0800, Standard Review Plan, Section 9.1.2, Spent Fuel Storage, Draft Revision 4,

2. Proposed Revision 2 to Regulatory Guide 1.13, Spent Fuel Storage Facility Design Basis, and

3. Memorandum from L. Kopp (NRC) to T. Collins (NRC), Guidance on the Regulatory Requirements for Criticality Analysis of Fuel Storage at Light-Water Reactor Power Plants.

Appendix A of 10 CFR Part 50, General Design Criteria (GDC) for Nuclear Power Plants, provides a list of the minimum design requirements for nuclear power plants. According to GDC 62, Prevention of criticality in fuel storage and handling, the licensee must limit the potential for criticality in the fuel handling and storage system by physical systems or processes.

According to GDC 61, Fuel storage and handling and radioactivity control, specifies, in part, that the licensee's fuel storage systems shall be designed with residual heat removal capability having reliability and testability that reflects the importance to safety of decay heat removal, and with the capability to prevent significant reduction in fuel storage coolant inventory under accident conditions. Meeting GDC 61 demonstrates that sufficient SFP cooling capacity and makeup sources are available during refueling and that time is available before pool boiling to supply makeup water following a loss of forced cooling.

Attachment 2 to Matrix 5 of Section 2.1 of NRC Review Standard RS-001, Revision 0, provides the NRC staff review guidance used to determine the adequacy of SFP cooling capability. It supersedes the guidance of paragraphs III.1.d and III.1.h of the Standard Review Plan (NUREG-0800), Section 9.1.3. Section 3.1 of RS-001 states that "the licensee demonstrates adequate SFP cooling capacity by either performing a bounding evaluation or committing to a method of performing outage-specific evaluations." The analysis conditions to be assumed for

bounding and cycle-specific analysis are given in Section 3.1.1 of RS-001. Section 3.2 of RS-001 provides guidance regarding requirements for adequate makeup supply

The licensee cited Saint Lucie (SL) and Waterford as precedent licensing submittals. The NRC staff found that TP's SFP and SFP crane design from SL, as well as the fact that the SL request at the time of issuance had not been approved, made the reviews different. While some similarities existed with Waterford, the Waterford submittal was not of substantial assistance to the NRC staff.

3.0 TECHNICAL EVALUATION

3.1 Spent Fuel Storage Rack Capacity and Cooling

To extend full core reserve (FCR) capability, the licensee intends to install a freestanding spent fuel storage rack module in the cask area of each unit's SFP. The additional storage capacity provided by each unit's case area rack will be used to temporarily store spent fuel during refueling outage fuel offloads and during nonoutage fuel shuffles. The new cask area spent fuel storage racks will also use Boral™ as the neutron absorbing poison. The racks are designed for Region I storage of 131 assemblies of either fresh or spent fuel, regardless of its burn-up history, bringing the total storage capacity of each unit up to 1535 assemblies.

In a letter dated October 21, 2002, the licensee requested a reduction in the reactor core offload start time. Within this submittal was a thermal-hydraulic analysis that includes the SFP decay heat load impact caused by adding a new cask area spent fuel storage rack. In a letter dated March 4, 2003, the NRC staff approved the reduction in core offload decay time. The licensee's previously submitted thermal-hydraulic analysis is repeated below.

3.1.1 Spent Fuel Pool Cooling and Cask Pit Storage Rack Design

All spent fuel at TP is stored underwater in the respective unit's SFP. Each SFP is currently licensed to store a total of 1404 fuel assemblies in high-density racks using Boraflex-neutron absorbing panels. The licensee has designed the new storage racks to increase fuel storage capacity while maintaining criticality control. The new racks consist of an 11 x 12 array with one corner cell eliminated to provide a storage location for the fuel handling tool. Each rack will increase the capacity of its respective SFP by 131 assemblies to a total of 1535 assemblies. For criticality control, the new racks use a combination of geometric spacing and a fixed neutron absorber, Boral. The licensee designed each of the racks for Region 1 storage, which permits storage of either fresh or spent fuel regardless of burnup history. Based on this capacity, current spent fuel inventory, and projected discharges, the Unit 3 FCR will expire in year 2007 and Unit 4 will lose FCR by 2009.

Each storage pool is provided with a dedicated cooling system. Each SFP cooling system consists of one 100-percent capacity pump, heat exchanger, filter, demineralizer, piping and associated valves and instrumentation. The pump draws water from the pool, circulates it through the heat exchanger, and returns it to the pool. Component cooling water (CCW) cools the heat exchanger. A 100-percent capacity spare pump is also permanently piped into the SFP cooling system. Both SFP cooling pumps are powered from the same breaker via a transfer switch. Thus, this spare pump is capable of operating in place of the main pump, but not parallel to it. The spare pump maintains the system's functional capability, assuming a

singe active failure of the SFP pump. In addition, an emergency spare pump with a low flow capacity can be aligned to provide cooling.

The licensee, indicated that the cask area is an integral portion of each unit's SFP, with no walls or barriers separating the cask area from the remainder of the pool. The cask area is located along the east wall in the middle of the SFP. Therefore, there is free exchange of water between the cask area and the surrounding areas of the SFP to the north, west, and south. Thermal-hydraulic mixing within the cask area, as well as within the remainder of the pool, is provided by the SFP cooling system. The local heat-up effect in the cask area is the same as elsewhere within the SFP.

The licensee, also stated that the fuel pool cooling suction line penetrates the SFP wall above the height of the stored fuel assemblies. This penetration location prevents the loss of water resulting from a potential suction line rupture. NRC Safety Evaluation Report dated March 15, 1972 indicates that the piping is arranged so that the failure of any pipe would not drain the pool below a level 6 feet above the tops of the fuel elements, and is therefore acceptable. The SFP cooling system return line has a ½-inch hole in the pipe near the normal level that serves as a siphon breaker.

Makeup to the SFPs to maintain water level can be provided from a variety of sources. The credited makeup source for the SFPs is 100 gallons per minute (gpm) from the demineralized water system (DWS). In the event the DWS is not available, alternate makeup can be provided via the seismic Category I refueling water storage tank, or via temporary (non-Category I) connections from the fire water system or primary water storage tank.

3.1.2 Spent Fuel Pool Heat-up Analysis

The current SFP bulk decay heat calculations of record are described in the Updated Final Analysis Report (UFSAR), Appendix D, Section 3.2. Though originally prepared to describe the supporting analysis for the installation of high-density storage racks, the licensee updated the SFP heat-up analysis to reflect thermal power uprate and 24-month fuel cycle assumptions. Subsequently revised pursuant to 10 CFR 50.59 requirements, the UFSAR currently reflects analysis supporting full core offload practices and moving irradiated fuel in the reactor vessel as early as 108 hours after reactor shutdown for a typical 18-month refueling cycle. The analysis used bounding values such as a maximum CCW inlet water temperature and a maximum heat generation assuming all SFP rack spaces were filled.

The licensee's earlier submittal allowing the movement of irradiated fuel 72 hours after reactor shutdown also required an update of supporting decay-heat calculations. The TP UFSAR currently addresses four different SFP heat-up cases derived from the NRC's Standard Review Plan (SRP). In support of the NRC-approved amendment for the reduction of decay time to 72 hours, the licensee redefined the SRP cases to reflect the planned refueling practice of full core offloads. The abnormal case is interpreted to be an unplanned or emergency offload. The updated SFP heat-up analysis uses the assumptions that the offload capacity in the SFP includes an added spent fuel storage rack in the cask loading area of the pool and that all other storage racks are filled with previously discharged fuel.

The licensee’s acceptance criteria for the SFP bulk heat-up analysis follows:

- Bulk maximum SFP temperature shall remain below 150 EF from a full core offload during a planned refueling.

- Bulk maximum SFP temperature shall remain below 212 EF during an unplanned offload evolution.

While the 150 EF acceptance criterion for planned refuelings from a full core offload was established for the SFP cooling systems as part of the licensee’s plant thermal power uprate, the 212 EF acceptance criterion specified for unplanned offloads is representative of bulk SFP boiling conditions.

The licensee’s results for SFP bulk heat-up analysis includes the following scenarios:

Case 1: Planned Refueling (1a, 1b)

Case 2: Planned Operation

Case 3: Unplanned Operation With SFP Cooling

Case 4: Unplanned Operation Without SFP Cooling

In Case 1a for planned refueling offloads, the licensee analyzed a typical offload scenario for a full core offload at 72 hours after reactor shutdown with a CCW inlet temperature of 85 EF and a transfer rate of eight assemblies per hour. The licensee determined that the bulk SFP water temperature is 147 EF, which is below the design temperature (acceptance criterion) of 150 EF. In Case 1b, however, using a 72-hour decay time and all bounding values such as a CCW inlet temperature of 105 EF, the licensee determined that the bulk SFP water temperature is 165 EF, which exceeds the design temperature.

Therefore, in the reduction of decay time submittal, the licensee proposed the use of a calculation methodology allowing modification of several input parameters using actual values at the time of fuel offload to ensure the bulk SFP water temperature would remain below the design temperature. Using the calculation methodology rather than bounding calculations would allow the licensee to vary the actual offload start time (not earlier than 72 hours), average offload rate, and actual cooling water temperature. The licensee could also use the actual heat load in the SFP, rather than assuming the heat load from a full SFP. Furthermore, in the February 11, 2003, supplemental letter for the above submittal, the licensee stated that fuel offload under normal conditions will be initiated only when the initial conditions project a maximum SFP temperature of less than 150 EF. On March 4, 2003, by the issuance of amendments for a reduction of decay time to 72 hours, the NRC staff approved the acceptability of the licensee’s calculation methodology in predicting the maximum bulk SFP water temperature for planned offloads to maintain the bulk SFP water temperature below the design temperature.

The licensee, in their September 8, 2003, letter, states that the assembly transfer rates (offload rates) of six per hour and eight per hour were selected to reflect a currently bounding and maximum future transfer rate, respectively. Actual fuel transfer rates during refueling outages

have not exceeded five assemblies per hour. The transfer rate is administratively controlled by plant procedures and is presently limited to a maximum of six fuel assemblies per hour.

In Case 2 for planned operation offloads, the licensee analyzed 1/3 core offload with full capacity inventory at 36 days after reactor shutdown. The licensee determined that the bulk SFP water temperature is 121 EF, which is below the design temperature of 150 EF.

In Case 3 for unplanned operation with SFP cooling, the decay heat load is based on a full core offload beginning at 72 hours plus a refueling load (1/3 core) that has decayed for 36 days with all other storage locations filled, including the fuel storage rack in the cask loading area. The licensee conservatively assumed an instantaneous offload of the entire core at 72 hours. An assumption of a single failure is not required; therefore, the SFP cooling system is operational. Under these conditions, the licensee determined that the maximum bulk SFP water temperature is 183 EF with a CCW inlet water temperature of 105 EF. The maximum steady-state temperature is reached 25 hours after offload. The licensee determined that the SFP cooling capacity is sufficient to maintain the maximum bulk SFP water temperature below boiling (212 EF). In Case 4 for unplanned operation without SFP cooling, if SFP cooling was lost at the time of the maximum pool water temperature (183 EF), the pool would reach boiling conditions in 1.5 hours.

The licensee states that when the SFP heat-up analysis predicts that the bulk SFP water temperature would exceed 150 EF under some offload scenarios (e.g., Case 1b), administrative controls will be relied upon to maintain pool temperature below 150 EF. Administrative controls described in the proposed (LAR) will be implemented by the TS Bases document and various plant procedures. The licensee, in it's September 8, 2003, letter, states that administrative controls on SFP bulk water temperatures would suspend fuel offload activities at a temperature that would limit the maximum SFP bulk temperature to less than the 150 EF criterion.

The NRC staff finds the assumption of an added cask area fuel storage rack with a decay time of 72 hours has been incorporated into the analysis with acceptable results. The previously NRC-approved calculation methodology remains acceptable in predicting the maximum bulk SFP water temperature for planned offloads to maintain the bulk SFP water temperature below the design temperature.

3.1.3 Spent Fuel Pool Local Thermal-hydraulic Analysis

The licensee's current thermal-hydraulic analysis of record is described in the TP UFSAR, Appendix 14D, Section 3.3. This analysis was performed in support of the currently installed high density storage racks. Given the increased decay heat associated with the increased cask area storage rack capacity (and a reduction of the decay time to 72 hours), the licensee performed a new analysis to determine whether the water in the storage racks will remain subcooled. The licensee's acceptance criteria for the SFP local thermal-hydraulic analysis follows:

- The local maximum SFP temperature shall remain below the local saturation temperature of the water.

- The maximum fuel cladding temperature in the SFP shall remain below the local saturation temperature of the water.

Using computational fluid dynamics, the licensee determined fluid flows and temperatures within a rack cell loaded with fuel having a 72-hour decay time. The licensee performed the computational fluid dynamics analysis utilizing the FLUENT-™ fluid flow and heat transfer modeling program. The licensee evaluated a single bounding case that included the maximum bulk SFP temperature of 150 EF and decay heat load, and conservative hydraulic parameters. Examples of key assumptions used for the SFP local thermal-hydraulic analysis include no downcomer flow existing between the individual storage rack modules and rack cell inlet temperatures equal to the SFP bulk temperature of 150 EF. The licensee calculated a maximum local water temperature of 192 EF and a maximum fuel clad temperature of 236 EF.

The licensee further states that the saturation temperature of water in the SFP increases with increasing depth and the critical location for localized boiling in the fuel racks is at the top of the active fuel height. The minimum depth of water at the top of the active fuel height is 25.75 feet. At this water depth, the saturation temperature of water is 241 EF. Therefore, the licensee determined that both the calculated maximum local water temperature and maximum fuel cladding temperature remain below the local saturation temperature.

Based on the licensee's analysis which determined that the SFP water will remain subcooled, the NRC staff finds the effects on the local SFP water temperature and fuel cladding temperature due to increased cask area storage rack capacity with a 72-hour decay time to be acceptable.

3.1.4 Time-To-Boil and Makeup Analysis

The licensee's current time-to-boil analysis of record is described in the TP UFSAR, Appendix 14D, Section 3.2. The licensee performed an updated time-to-boil analysis to support the increased cask area storage rack capacity with a decay time reduction to 72 hours. The licensee's acceptance criteria for this analysis follows:

- The time to heat the SFP to boiling (212 EF) after loss of SFP cooling during an unplanned offload evolution shall be sufficient to permit alignment of available makeup sources.

- The required makeup rate to replace water due to boiling shall be less than the existing makeup rate of 100 gpm.

Using the updated analysis described above, the licensee determined the time-to-boil for a full core offload at 72 hours, following a forced shutdown 36 days after a planned refueling shutdown with 1/3 core recently offloaded. The licensee assumed an 18-month fuel cycle. The licensee calculated a time-to-boil of 1.5 hours, assuming that the SFP cooling is lost at the time of a maximum pool temperature of 183 EF. The license states that the calculated time-to-boil of 1.5 hours provides sufficient time to establish makeup to the SFP.

The licensee determined that the makeup for the maximum boil-off at 212 EF is 81 gpm and therefore, is within the 100 gpm acceptance criteria for the SFP bulk heat-up analysis.
The licensee states that available makeup sources with flow rates that satisfy the 100 gpm acceptance criterion are as follows:

Make-up Water Source	Flow Rate (gpm)
demineralized water system	174
primary water system - direct connection	415
primary water system - local hose station	500
fire hose station (outside SFP)	100
refueling water storage tank (borated water)	100

The licensee pointed out that updated analysis assumptions are sufficiently conservative such that actual times to reach boiling conditions in the SFP will be longer than those cited in the analysis results. For example, the licensee's analysis assumes that the entire core is off loaded to the SFP in one complete step at 72 hours after shutdown; therefore, no credit is taken for the time dependent nature of the offload activities which can span 26 hours for a full core offload at a rate of six assemblies per hour. The licensee also assumed that CCW system is at its maximum temperature of 105 EF.

Based on the licensee's above analysis which includes the addition of a cask area fuel storage rack to both TP Units 3 and 4, and the analyzed 72-hour decay time, the NRC staff finds that the time-to-boil results are acceptable and that the SFP cooling system for each unit has sufficient makeup water sources.

3.1.5 Maintaining Spent Fuel Pool Offload Capability

The purpose for installing the cask area fuel storage racks is to provide additional storage capacity for spent fuel to allow refueling outage fuel offloads and nonoutage fuel shuffles. In the submittal, the licensee states, "because the cask areas will eventually be needed for loading fuel into transfer casks, the cask area racks will be removed, cleaned, and stored at an alternate location in the radiation controlled area prior to any spent fuel cask loading operations." The NRC staff questioned the measures that will be taken to ensure that the capability to unload spent fuel to a cask is not lost. The licensee committed that a restriction would be imposed to ensure the capability to unload and remove the cask area racks when cask loadings are necessary. To ensure the capability to unload spent fuel to a cask is not lost, the NRC has added the following condition to both units' licenses:

> The licensee shall restrict the combined number of fuel assemblies loaded in the existing spent fuel pool storage racks and cask pit rack to no more than the capacity of the spent fuel pool storage racks. This condition applies at all times, except during activities associated with a reactor core offload/reload refueling condition. This restriction will ensure the capability to unload and remove the cask pit rack when cask loading operations are necessary.

The NRC staff concludes that the proposed license condition provides adequate assurance that the ability to offload spent fuel to a cask is maintained.

3.1.6 Summary

The licensee's submittal proposes modifying Section 5.6, Design Features - Fuel Storage, of the TSs for TP Units 3 and 4 to increase each unit's spent fuel storage capacity by combining the cask pit rack and existing SFP storage rack capacities. Based on the licensee's analysis, which determined that the SFP water will remain subcooled, the NRC staff finds the effects on the local SFP water temperature and fuel cladding temperature due to increased cask area storage rack capacity with a 72-hour decay time to be acceptable. In addition, the NRC staff finds that the earlier NRC-approved calculation methodology for planned offloads remains acceptable and that the licensee has demonstrated that adequate cooling and makeup for the SFP exists for planned and unplanned offload conditions. Therefore the proposed change to increase the SFP capacity as described in Section 5.6 of the TSs is therefore acceptable.

3.2 Criticality

3.2.1 Licensing Basis Change

As described in the submittal, the licensee proposed to change the licensing basis for the TP SFPs from 10 CFR 70.24 to 10 CFR 50.68 compliance. FPL provided a detailed description of how it complied with each of the eight requirements in 10 CFR 50.68(b). These requirements include the following:

1) using plant procedures to ensure subcriticality and safe handling of fuel assemblies;

2) ensuring new fuel storage racks are subcritical by defined margins under both unborated and optimum moderation conditions;

3) verifying spent fuel storage racks are subcritical by defined margins under both borated and unborated conditions;

4) ensuring the quantity of Special Nuclear Material stored onsite is less than the quantity necessary for a critical mass;

5) providing radiation monitors in fuel storage and handling areas;

6) maintaining the maximum U-235 enrichment of fresh fuel assemblies less than or equal to five percent by weight; and

7) updating the UFSAR in a timely fashion after choosing to comply with 10 CFR 50.68.

The NRC staff reviewed each of the requirements which did not require a criticality analysis to verify that the licensee would meet the conditions. The NRC staff found that the licensee's responses provided reasonable assurance that it would meet each of the requirements indicated in 10 CFR 50.68(b).

For requirements which needed a criticality analysis to demonstrate compliance, the NRC staff reviewed the information provided by the licensee as well as criticality analyses from previous TP SFP amendments which were approved by the NRC staff. During its review, the NRC staff identified a TP safety evaluation dated July 19, 2000, which approved a previous amendment request by FPL to credit soluble boron in the SFP criticality analyses. In the NRC staff's review of that amendment request, it used the regulatory limits for k_{eff} that are described in

10 CFR 50.68 for both fresh and spent fuel storage racks. The analysis was found acceptable by the NRC staff and in compliance with the regulatory limits. Therefore, the NRC staff finds that FPL will comply with all of the requirements of 10 CFR 50.68 and that a change in the licensing basis for the TP SFPs is appropriate and acceptable.

3.2.2 Criticality Analysis Computer Codes

The licensee performed the analysis of the reactivity effects for the TP cask pit storage racks with the MCNP4a code, a continuous energy three-dimensional Monte Carlo code. The code used the ENDF/B-V and ENDF/B-VI cross section libraries. The MCNP4a code was benchmarked against criticality experiments under conditions which bound the range of variables in the rack designs. The critical benchmark experiments considered the effects of varying fuel enrichment, boron-10 loading, lattice spacing, fuel pellet diameter, and soluble boron concentration. The experimental data are sufficiently diverse to establish that the method bias and uncertainty will apply to TP storage rack conditions. The licensee determined the MCNP4a code calculation (methodology) bias is 0.0009 with a 95/95 bias uncertainty of +/- 0.0011.

In addition to using the MCNP4a code to perform the criticality analyses, the licensee employed the CASMO-4 code to perform the fuel depletion analyses. The licensee used this two-dimensional multi-group transport theory code to determine the isotopic composition of the spent fuel and determine the reactivity effect of the fuel and rack tolerances. From this code, the licensee determined the reactivity effect (delta-k) for each manufacturing tolerance of the fuel assemblies and storage racks.

The NRC staff reviewed the licensee's application of the codes to determine whether each could reasonably calculate the appropriate parameters necessary to support the maximum k_{eff} analyses. The NRC staff concludes that the licensee's use of the MCNP4a code for calculation of the nominal k_{eff} was appropriate since it was benchmarked against experimental data which bounds the proposed assembly and rack conditions for the TP SFPs. Additionally, the NRC staff finds that the licensee's use of the CASMO-4 code was acceptable for determining the delta-k for each manufacturing tolerance and performing the fuel depletion analyses for the TP units.

3.2.3 Analysis Methodology

In accordance with applicable regulatory guidance, the licensee performed criticality analyses of its SFP. The licensee employed a methodology which combines a worst-case analysis based on the bounding fuel and rack conditions, with a sensitivity study using 95/95 analysis techniques. The major components in this analysis were a calculated k_{eff} based on the limiting fuel assembly, SFP temperature and code biases, and a statistical sum of 95/95 uncertainties and worst-case delta-k manufacturing tolerances.

In performing its criticality analysis, the licensee first calculated a k_{eff} based on nominal core conditions using the MCNP4a code. The licensee determined this k_{eff} from the limiting (highest reactivity) fuel assemblies stored in the SFP. The licensee analyzed the three types of assemblies currently stored in the TP SFPs. These assemblies are the Westinghouse 15 x 15 LOPAR assembly, the Westinghouse 15 x 15 Optimized Fuel Assembly (OFA), and the Westinghouse 15 x 15 Debris Resistant Fuel Assembly (DRFA). The licensee stated that the

Westinghouse 15 x 15 OFA and Westinghouse 15 x 15 DRFA are identical in terms of dimensions that are important to reactivity. The licensee, therefore, referred to these assemblies in its analysis as the Westinghouse 15 x 15 OFA/DRFA.

The licensee performed its reactivity analyses for various enrichments, cooling times, burnups, and the bounding cladding thicknesses. In performing these calculations, the licensee assumed appropriately conservative conditions, such as an infinite radial checkerboard array and a 30 centimeter water reflector in both axial directions. The licensee identified the bounding assemblies as the Westinghouse 15 x 15 OFA/DRFA. Since the licensee's criticality analysis is specific to assembly designs currently stored in the SFP, the licensee must analyze any other fuel assemblies it intends to use in TP Unit 3 and 4 to verify that the existing analyses remain bounding. The NRC staff would review these changes either in future licensing amendments, as needed, or through inspections and auditing of the licensee.

To the calculated k_{eff}, the licensee added the methodology bias as well as a reactivity bias to account for the effect of the normal allowable range of SFP water temperatures. As stated in the description of the MCNP4a code, the licensee determined the methodology bias from the critical benchmark experiments. For the proposed cask pit rack storage configuration, the licensee analyzed the reactivity effects of the SFP water temperature. The licensee determined that the SFP moderator temperature coefficient of reactivity is negative. The licensee calculated the reactivity bias associated with a temperature decrease to the maximum density of water, 4 degrees Celsius (EC). The licensee added the reactivity bias to the calculated k_{eff} to provide conservative margin in the calculation.

Finally, to determine the maximum k_{eff}, the licensee performed a statistical combination of the uncertainties and manufacturing tolerances. The uncertainties included the MCNP4a bias uncertainty and the MCNP4a uncertainty. The licensee determined both of these uncertainties to a 95/95 threshold which is consistent with the requirements of 10 CFR 50.68. In the submittal, the licensee provided, at the request of the NRC staff, a comprehensive list of the manufacturing tolerances considered, as well as the reactivity effect calculated for each. For each tolerance, the licensee used the CASMO-4 code to calculate a delta-k between the nominal condition and the most limiting tolerance condition. By using the most limiting tolerance condition, the licensee calculated the highest reactivity effect possible. This results in conservative margin since the tolerances will always bound the actual parameters. Once the reactivity effects for each of the tolerances were determined, the licensee statistically combined each of the manufacturing tolerances with the 95/95 uncertainties. Additionally, in a letter dated September 8, 2003, the licensee provided a summary of the tolerances not considered in the original criticality analysis. These tolerances included parameters, such as fuel rod pitch, fuel pellet outer diameter, fuel rod cladding inner and outer diameters, and guide tube inner and outer diameters. The licensee determined the delta-k values for each of these tolerances, which demonstrated that the exclusion of the parameters from the original analysis was acceptable since the reactivity effect was negligible and their inclusion would not result in exceeding any regulatory limits.

The NRC staff reviewed the licensee's methodology for calculating the reactivity effects associated with uncertainties and manufacturing tolerances as well as the statistical methods used to combine these values. The NRC staff finds the licensee's methods conservative and acceptable.

3.2.4 Criticality Analysis Results

The cask pit racks are defined as Region 1 storage racks capable of storing fresh and spent fuel regardless of burnup history. To demonstrate the acceptability of the proposed storage configurations, the licensee analyzed an appropriately conservative and bounding storage configuration. The analyzed configuration assumed a fully-loaded cask pit storage rack of fresh fuel assemblies at the maximum U-235 enrichment of 4.5 weight percent. Additionally, the licensee made other conservative assumptions, such as neglecting neutron absorption in minor structural members, assuming an infinite radial array, and neglecting the presence of burnable poisons in the fuel assemblies. The NRC staff reviewed each of the assumptions used in the licensee's analyses and found that the assumptions were used consistent with the NRC staff's guidance.

Since the cask pit rack proposed is designed for temporary storage and may be installed or removed from the SFP at any time, the proper installation of the rack is important to reactivity control and criticality prevention. In the submittal of September 8, 2003, the licensee provided information related to inter-rack reactivity calculations, spacing between the cask pit rack and adjacent spent fuel storage racks, and orientation of the cask pit rack.

The location of the cask pit rack in the SFP is adjacent to both Region 1 and Region 2 spent fuel storage racks. A review of the inter-rack reactivity results showed that Region 2, which contains fewer Boraflex panel inserts and has a smaller rack pitch, is the limiting interface to the cask pit rack. The licensee calculated a higher k_{eff} for Region 2 than Region 1. Therefore, the licensee analyzed the bounding rack interface based on Region 2 reactivity conditions.

The licensee provided an analysis to demonstrate an assumption in the analysis regarding the 2-inch spacing between the cask pit rack and adjacent spent fuel racks would be maintained during cask pit rack installation. The licensee stated that a go/no-go gauge measurement would be performed to establish an independent verification of the spacing and verification of this spacing as a quality control hold-point in the written installation procedure.

The as-designed cask pit rack contains Boral neutron absorber panels mounted on the outside faces of the rack, except for the rack periphery cells intended to face the east SFP wall. The licensee's criticality analysis from its original submittal accounted for this design feature and credited the neutron leakage that would occur to the SFP wall. However, the NRC staff requested the licensee provide additional information describing the reactivity effect of improperly orienting the cask pit rack in the SFP. An improper orientation, such that the rack were rotated either 90 or 180 degrees, and subsequent loading could potentially increase the reactivity of the rack above what the licensee calculated in its original analysis, since the rack face without the Boral panels would be adjacent to one of the spent fuel storage racks. The licensee chose to provide additional information which would demonstrate that the potential to improperly orient the rack and subsequently load it was unlikely and nearly impossible. The licensee provided the following information to support its conclusion:

1. The cask area rack design contains an excluded corner cell designated for the storage of the fuel handling tool. This excluded cell allows verification by visual inspection of the proper orientation during installation.

2. The cask area rack has a rectangular footprint. This precludes improper installation in any orientation other than 180 degrees rotated. This eliminates two potential improper installation configurations (90 and 270 degrees rotated).

3. The rack installation procedure will require quality control hold-points to verify proper rack orientation before and after installation in the pool (Ref. 3). The hold-points provide an independent verification that the rack is properly oriented.

4. If the rack were installed in an improper orientation, the loading of fresh fuel in the rack would be nearly impossible since the fuel handling tool bracket on the east SFP wall would now be blocked by the rack. This bracket is necessary to transfer the fuel handling tool from its storage position on the north side of the spent fuel pit bridge crane to the south side of the crane where the transfer canal and new fuel storage are located.

The NRC staff reviewed the licensee's controls and procedures described in Refs. 2 and 3 to ensure the cask pit rack is proper oriented in the SFP. In Ref. 3, the licensee provided a detailed description of the information to be included in the quality control hold-points. The licensee chose to use the hold-points, which are administrative and procedural controls, rather than perform a criticality analysis of a rack misorientation accident and update its UFSAR report. Therefore, the licensee will not be permitted to make substantial changes to the hold-points via the 10 CFR 50.59, Changes, tests, and experiments, process.

It is stated in 10 CFR 50.59(c)(2)(v) that a licensee must seek a license amendment if the proposed change would:

> Create the possibility for an accident of a different type than previously evaluated in the final safety analysis report (as updated).

The NRC staff has determined that changes to the quality control hold-points will create the possibility of a rack misorientation accident, that the licensee has neither analyzed nor included in the UFSAR. However, the NRC staff agrees that the controls and procedural checks, as described by the licensee in its supplements to the amendment, provide reasonable assurance that the cask will be in the proper orientation to preclude a rack misorientation accident. To ensure the possibility of an accident of a different type than previously evaluated in the UFSAR is not created by the misorientation of the cask racks, the NRC is adding the following condition to both units licenses:

> The licensee shall establish two hold points within the rack installation procedure to ensure proper orientation of the cask rack in each unit's spent fuel pool. Verification of proper cask pit rack orientation will be implemented by an authorized Quality Control inspector during installation of the racks to ensure consistency with associated spent fuel pool criticality analysis assumptions.

The licensee calculated maximum k_{eff} values for both borated and unborated cask pit rack storage cases. The licensee's results show a maximum k_{eff} of 0.9562 for an unborated case, which is below the regulatory limit of 1.0. Additionally, the licensee calculated a maximum k_{eff} of 0.9307 under normal conditions when 200 part per million (ppm) of soluble boron is credited. This is below the regulatory limit of 0.95.

In addition to performing analyses of normal storage conditions, the licensee analyzed accident conditions to ensure regulatory limits will be met. The licensee analyzed the following accident conditions: 1) temperature and water density effects; 2) lateral rack movement; 3) assembly drop; and 4) abnormal location of a fuel assembly. In all of these analyses, the licensee credited soluble boron for reactivity control, thereby, offsetting any increase in reactivity. For the analysis of the effects of temperature and water density, the licensee considered a SFP heat-up event since its base case assumed water at its maximum density. The results of the analysis showed that the negative SFP moderator temperature coefficient would cause the reactivity in the cask pit rack to decrease. Additionally, the licensee found that voiding would further reduce the reactivity in the rack. The licensee's seismic analysis of the potential for lateral rack movement demonstrated that any movement would be negligible. Therefore, the licensee concludes that the rack spacing would not decrease below the value assumed in the criticality analysis and there would be no positive reactivity effect on the pool.

Next, the licensee analyzed both vertical and horizontal assembly drops, and concluded that an assembly dropped horizontally on top of the cask pit rack would be neutronically decoupled from other assemblies in the rack due to a separation distance greater than 12 inches. For a vertical drop accident, minor base plate deformation was possible in the cask pit rack; however, the licensee's results show that the deformation would be minor and the reactivity effects would be statistically insignificant. Finally, the licensee analyzed the cask pit rack for a misloaded assembly. Since the rack was designed to store fresh fuel at the maximum permissible enrichment, no credible misloading event would increase the reactivity of the cask pit rack. However, the potential exists to misplace an assembly in the cell designated to hold the fuel handling tool. The licensee identified the controls currently in place as the following:
1) independent verifications during the design stage and loading operations, 2) identification of this cell as a restricted location on fuel move-sheets, and 3) qualified operators who will be aware of the fuel storage restriction on this cell. Nonetheless, the licensee's analysis of a maximum enrichment fresh fuel assembly placed in this location determined that 624 ppm of soluble boron was necessary to maintain the k_{eff} less than or equal to 0.95.

The NRC staff has reviewed the accidents analyzed by the licensee and concludes that the results obtained demonstrate that the cask pit rack is adequately designed to preclude a criticality event during accident conditions provided that the administrative controls discussed are properly implemented and assumptions made in the associated analysis are maintained.

3.2.5 Summary

The NRC staff reviewed the effects of the proposed changes, as well as the change in the SFP licensing bases, using the requirements of 10 CFR 50.68 and GDC 62. The NRC staff found that under both normal and accident conditions the licensee would be able safely store fuel in the SFP and comply with NRC regulations.

3.3 Radiological Consequences

Currently, the fuel storage racks for each unit have a storage capacity of 1404 fuel assemblies (cells). The proposed cask area racks will expand storage capacity to 1535 assemblies. This

amendment application does not involve spent fuel consolidation. The new racks are not double-tiered, and all racks will be freestanding, siting directly on the floor of the SFP cask area. According to licensee plans, the rack will remain in the pool until transport cask handling will be necessary. At that time, the cask area fuel rack will be unloaded, removed from the pool and properly stored onsite.

3.3.1 Occupational Radiation Exposure

The NRC staff has reviewed the licensee's plan for the additional spent fuel rack for each unit with respect to occupational radiation exposure. A number of facilities have performed similar operations in the past. On the basis of the lessons learned from these operations and consistent with other plants' experience with storage rack expansion, the licensee estimates that the proposed fuel rack additions can be performed for about 0.6 person-rem collective occupational worker dose.

All of the operations involving the installation of the racks will be governed by procedures. These procedures were prepared with full consideration of ALARA (as low as is reasonably achievable) principles, consistent with the requirements of 10 CFR Part 20. The Radiation Protection department will prepare Radiation Work Permits (RWPs) for the various jobs associated with the in-pool and out-of-pool operations. The RWPs and supporting job procedures will establish requirements for timely external radiation and representative airborne surveys, personal protective clothing and equipment, individual dose-monitoring devices and other access and work controls consistent with good radiation protection practices and Part 20 requirements. Continuous health physics technician (HPT) coverage will be provided and maintained for the installation of the rack, removal, decontamination and storage of the rack. The HPT will participate in prejob briefings for all phases of the rack project. Each member of the project team will receive radiation protection training related to the rack operations, consistent with the requirements of 10 CFR Part 19, including lessons learned related to past fuel racking projects by the contractor. Project-specific training will include (among other things) hot particle hazards and for potential for extremity doses from handling potential activated debris. Pre-job briefings will be used to inform workers and health physics technicians HPT of job scope and techniques (including pertinent ALARA issues).

For out-of-pool work activities, all workers will be provided with thermoluminescence dosimeters (TLD) and self-reading dosimeters. Periodic radiation surveys will be conducted for direct radiation and loose surface contamination levels, as appropriate and in accordance with the governing RWP. Previous historical experience during similar reracking shows that radioactive airborne material levels in the above-pool work area should be negligible during the rack installation. However, appropriate breathing-zone air sampling will be performed, and installed building air monitors will be in operation. A supplementary continuous air monitor will provide continuous readout of general area airborne radioactive material levels, and is equipped with a preset alarm function. Personal respiratory equipment is available, if needed. In order to minimize contamination and airborne problems, equipment removed from the pool will be surveyed before removal, as it breaks the water surface, and resurveyed by or under the direction of a qualified HPT to determine if decontamination is needed.

The licensee does not plan to use underwater divers for cask installation/removal project. However, if divers are needed, the licensee is adequately prepared for that contingency. All

diving operations will be governed by special plant procedures. These procedures will require extensive prework surveys of the dive area, and the diver will be equipped with a survey meter that provides the HPT providing coverage with a direct dose readout at the surface. To ensure that these divers do not gain access to high and very high radiation sources (e.g., nearby spent fuel), appropriate controls will be established, such as physical barrier (e.g., a cage), and nearby adjacent fuel racks will be emptied of spent fuel to the extent possible. To further ensure that divers will maintain a safe distance from very high radiation sources, the plant will use warning barricades to alert divers and delimit the safe work area. Continuous audio communication will be in place to allow for continuous, pool-side surveillance of all diver activities. Because of the steep dose gradients presented by the water shielding, each diver will be provided with multiple TLDs and electronic dosimeters for whole body and appropriate extremity monitoring, with continuous, remote dose rate readouts for pool-side observation, monitoring by the HPT. The diving control procedure and survey criteria to be used by the plant meet the intent of 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. This Appendix was developed from the lessons learned from previous diver overexposures and mishaps, and summarizes good operating practices for divers acceptable to the NRC staff.

An underwater vacuum system will be used to supplement the installed SFP filtration system, so that radiation/contamination levels (including hot particles and debris) can be reduced. Before the racks are installed, the cask area SFP floor will be vacuum cleaned using remote tools from above the pool. The racks are designed to minimize pick up of contaminated materials, and the licensee does not expect to store older or potentially failed fuel in the cask area racks. Before the empty fuel racks are removed from the pool, they will be cleaned underwater using high pressure washing. Once cleaned and dried, radiation surveys will be performed to determine if further decontamination is needed before preparing the racks for storage. The racks will be bagged to minimize potential worker contamination and maintain doses ALARA. The licensee will use the existing SFP filtration system during fuel rack installation to maintain water clarity in the SFP. These design/engineering controls and handling procedures will help minimize the potential for creating airborne hazards and the spread of contamination (e.g., hot particles), while maintaining worker doses ALARA.

The storage of additional spent fuel assemblies (and the reduction from 100 hours down to 72 hours in minimum cooling time before fuel movement) in the SFP will result in negligible increases in the external dose rates on the refueling floor and in adjacent accessible areas to the SFP. Based on conservative shielding calculations by the licensee, the radiation zone designation for the existing, normally accessible areas around the fuel storage pool will not change. With spent fuel from a 72-hour core offload, in order to maintain dose rates less than 1.0 mrem/hr, old fuel (>5 years of cooling time) or its equivalent shielding (e.g., new fuel) will have to be placed in the cell row (barrier row) nearest the shield wall. In this worst case scenario (shortest cooling time), the maximum dose rates outside the concrete walls of the SFP will remain less that 1 mr/hr. The additional fuel storage should result in no changes in the plant radiation zone designations and no significant increases in radiation levels above and around the pool during fuel movements.

Based on the above, the NRC staff concludes that the SFP rack installation and removal/storage can be performed in a manner that will ensure that doses to the workers will be maintained ALARA. The NRC staff also finds the projected unit dose for the project of about

0.3 person-rem to be appropriate, and in the range of doses for similar SFP modifications at other plants and therefore acceptable.

3.3.2 Solid Radioactive Waste

Spent resins are generated by the processing of SFP water through the SFP purification system. Resin change out frequency is primarily driven by the water clarity requirement. The licensee predicts no change in the amount of resin generated as a result of the addition on one fuel rack. In order to maintain the SFP water reasonably clear and clean, and thereby minimize the generation of spent resins, the licensee will vacuum the floor of the SFP to remove any radioactive crud, sediment, and other debris before the new fuel rack modules are installed. Filters from this underwater vacuum will be a very minor source of solid radwaste. Overall, the licensee does not expect that this small increase in SFP storage capacity will result in a significant change in the long-term generation of solid-radioactive waste.

Because on-going volume reduction efforts have effectively minimized the amount of waste generated across industry, including TP, any small incremental increase is bounded by the plant original licensing basis described in the Final Environmental Statement and, therefore, is acceptable.

3.3.3 Gaseous Radioactive Wastes

The storage of additional spent fuel assemblies in the SFP is not expected to affect the offsite releases of radioactive gases from the SFP. Gaseous fission products such as Krypton-85 and Iodine-131 are produced by the fuel in the core during reactor operation. A small percentage of these fission gases are released to the reactor coolant from the small number of fuel assemblies which are expected to develop leaks during reactor operation. During refueling operations, some of these fission products enter the SFP and are subsequently released into the air. Since the frequency of refuelings (and, therefore, the number of freshly off loaded spent fuel assemblies stored in the SFP at any one time) will not increase, there will be no increase in the amounts of these types of fission products released to the atmosphere as a result of the increased SFP fuel storage capacity.

The increased heat load on the SFP from the storage of additional spent fuel assemblies (a 9 percent increase in capacity) could potentially result in a small increase in SFP evaporation rate. However, this increase in evaporation rate is not expected to result in any significant increase in the amount of gaseous tritium released from the pool. This has not been an operational problem with any previous reracks across industry, including rack expansions of much greater magnitude (up to a 35 percent capacity increase).

Thus, the licensee does not expect the concentrations of airborne radioactivity in the vicinity of the SFP to significantly increase due to the expanded SFP storage capacity. Gaseous effluents from the spent fuel storage area are combined with other station exhausts, and monitored before release. Past SFP area contributions to the overall site gaseous releases have been insignificant, and should remain negligible with the increased capacity. The impact of any increases in site gaseous releases should be negligible, and the resultant doses to the public will remain small fractions of 10 CFR Part 20 and 10 CFR Part 50, Appendix I dose limits.

3.3.4 Liquid Radioactive Wastes

The release of radioactive liquids will not be affected directly as a result of the SFP expansion. The SFP ion exchanger resins remove soluble radioactive materials from the SFP water. When the resins are changed out, the small amount of resin sluice water is processed by the radwaste system, before release to the environment. As stated above, the frequency of resin change should not change as a result of the installation of the new racks. Therefore, the amount of liquid effluent released to the environment as a result of the proposed SFP expansion is not expected to change.

3.3.5 Radiologically Impact

As indicated in the licensee's submittal, radiation protection personnel will monitor the doses to the workers during the SFP rack addition/removal operations, and all work will be in accordance with radiation work permits and implementing procedures. The licensee will provide procedures specifying required survey, personal dosimetry, and other work requirements and controls, consistent with the requirements of 10 CFR Part 20. The total occupational dose, summed for both units, to plant workers as a result of the SFP rack addition is estimated to be about 0.6 person-rem. This dose estimate is reasonable, given the work scope proposed, and is consistent with comparable doses for similar SFP projects performed at other plants. The SFP rack project will follow detailed procedures prepared with full consideration of ALARA principles, consistent with the requirements of 10 CFR Part 20.

Based on the above, the NRC staff concludes that the TP SFP rack additions can be performed in a manner that will ensure that doses to workers will be maintained ALARA. The estimated collective dose to perform the proposed SFP racking operation is a very small fraction of the annual collective dose accrued at the facility.

3.4 Structural Integrity

The new cask area storage racks proposed for use in the SFP are manufactured by Holtec International. The storage racks are freestanding and self-supporting, designed to the stress limits of, and analyzed in accordance with, Section III, Division I, Subsection NF of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code). The material procurement, analysis, fabrication and installation of the rack modules conform to 10 CFR Part 50, Appendix B.

3.4.1 Structural Materials

The structural materials used in the fabrication of the new spent fuel racks include: ASME A240-304L for all sheet metal stock and internally threaded support legs, ASME A564-630 precipitation hardened stainless steel (heat treated to 1100EF) for externally threaded support spindles and ASME Type 308 for weld material.

All these materials have been previously used in similar applications and are compatible with the spent fuel assemblies. In addition, these materials have a proven history in the SFP environment. These materials are, therefore, acceptable for used in this application.

3.4.2 Neutron Absorbing Material

The racks will employ Boral™ as the neutron poison material. Boral™ is a cermet composite material made of boron carbide and alloy 1100 aluminum. It is chemically inert and physically stable. Boral™ has a long history of applications in the SFP environment where it has maintained its neutron attenuation capability under thermal loads. The alloy 1100 aluminum forms an aluminum oxide layer on its surface when exposed to oxidizing environments. The film of aluminum oxide imparts sufficient pitting and general corrosion resistance and is typically formed a few days after being placed in water. Hydrogen, a product of the passivation process, may cause swelling from the racks. This can result in deformation of the storage cells when not vented. Boral™ panels are held in place by stainless steel sheathing covers attached to the racks using spot and/or intermittent welds. The gaps between these welds allow any hydrogen gas produced to be vented from the rack. Production of this hydrogen will decrease as the aluminum surfaces develop a protective oxide film. The neutron absorbing capability of Boral™ should not be affected by this corrosion process.

3.4.3 Summary

Based on its evaluation, the NRC staff finds that the materials in the spent fuel racks manufactured by Holtec International are compatible with the SFP environment of TP Units 3 and 4 and will not undergo material degradation to adversely affect their storage capability. In addition, the formation of the protective oxide film will not affect the neutron absorbing capability. The NRC staff concludes; therefore, that the materials used in the new spent fuel racks are acceptable.

3.5 Heavy Loads

3.5.1 Handling of Heavy Loads

The installation of each cask area rack into the SFP will involve handling heavy loads in the vicinity of the SFP. The licensee states that the spent fuel cask handling crane will be used for lifting the new racks into each building containing the SFPs. The two units share a 105 ton overhead bridge-type cask handling crane that is located outdoors and operates over the east end of both unit buildings containing the SFPs. Dry weights for the empty cask area rack and associated rigging are approximately 18 tons. An L-shaped door in each building's roof and side is located over the cask area in each SFP. The spent fuel cask handling crane will be used to transport the rack from an outside staging area through the L-shaped door directly over the cask area of the SFP.

In Section 3.5 of Appendix 1 to its letter dated November 26, 2002, the licensee stated that the general guidelines of Section 5.1.1 of NUREG-0612 would be satisfied as follows: (1) safe load paths will be defined for movement of the fuel storage racks; (2) all phases of rack installation activities will be conducted in accordance with approved procedures under supervision of a designated individual; (3) all crew members involved in the use of lifting and upending equipment will be trained and qualified using a program that satisfies the guidelines of American National Standards Institute (ANSI)/ASME B30.2 - 1976; (4) special lifting devices employed in the rack lifts will meet the guidelines of ANSI N14.6 - 1993; (5) other lifting devices will be selected, inspected, and maintained in accordance with ANSI B30.9 - 1971; (6) cranes will be inspected, tested, and maintained in accordance with ANSI/ASME B30.2 - 1976; and (7) the design of the cask handling crane will meet the guidelines of ANSI/ASME B30.2 - 1976

and Crane Manufacturers Association of America, CMAA-70. However, in Section 3.5 of Enclosure 1 to its letter dated November 26, 2002, the licensee stated 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.

With the exception of the use of a temporary hoist, the approach fully satisfies the criteria of Section 5.1.1 of NUREG-0612 and is acceptable.

By letter dated September 8, 2003, the licensee provided information regarding the planned use of the temporary hoist. The hoist and associated rigging are to be selected such that their rated load is greater than twice the lifted load. However, the use of a secondary hoist is inconsistent with the guidelines of NUREG-0612 in that the secondary hoist introduces additional active components whose failure could cause a load to drop. The NRC staff questioned whether the use of a longer rigging could eliminate the need for the secondary hoist and actions to reduce the probability of hoist failure if its use was necessary. By letter dated October 8, 2004, the licensee confirmed that use of a secondary hoist was necessary to avoid wetting the main hook and described measures to ensure the hoist would reliably hold the storage racks. The licensee stated that the use of the hoist, which is new and procured specifically for this purpose, will be infrequent and limited only to the rack installation and removal. The licensee also stated that use of the intermediate hoist will be controlled under the rigging and heavy loads program at TP, which incorporates applicable requirements from ANSI/ASME B30.1 through B30.22. The letter detailed specific inspection and test requirements from the program that would be applied to the hoist. These inspection and testing requirements in conjunction with the limited use of the new hoist appropriately reduce the probability of a load drop over safety-related structures, consistent with the intent of Section 5.1.1 of NUREG-0612.

By letters dated September 8, 2003, and June 21, 2004, the licensee provided additional information regarding measures that provide defense-in-depth for heavy load handling in and around the SFP. These measures ensure that heavy loads will not be lifted directly over stored irradiated fuel, the maximum practicable separation between heavy loads and stored fuel will be maintained, and the integrity of the SFP structure and the function provided by piping under the load path will be maintained in the unlikely event of a heavy load drop.

The licensee stated that the cask area racks will be moved into the auxiliary building through an L-shaped door that is located directly over the cask area. In addition to the physical constraint provided by the door opening, limits on crane motion imposed by an administratively controlled interlock prevent movement of the new rack over existing racks containing fuel assemblies. The licensee will move irradiated fuel from the fuel storage cells adjacent to the cask area to provide about a 1-foot separation between the outer boundary of the lift envelop and any stored fuel. This distance provides a reasonable margin to ensure that a postulated rack drop would not directly impact stored fuel.

With regard to a postulated rack drop in the cask area of the SFP, the licensee stated that an existing 25 ton cask drop analysis bounds the consequences of a rack drop. The rack has a weight of approximately 18 tons and is constructed as a low density honeycomb structure, which is less likely to damage the SFP floor than the more rigid cask. The analysis of a cask drop demonstrated that the pool floor would remain elastic during impact and that a crack would

not develop. Therefore, the effect of dropping the cask would be limited to local crushing of the concrete underlying the stainless steel liner plate. Although the load drop could damage the steel pool liner, normally closed valves would limit the total leakage from the pool to a value within the capacity of installed makeup water systems. In the letter dated June 21, 2004, the licensee described the degree that the cask drop analysis conformed to the criteria of Appendix A to NUREG-0612. The NRC staff reviewed the assumptions and methodology used for the cask drop analysis and concluded that the analysis provides reasonable assurance that a drop of the cask area rack would be unlikely to uncover the stored fuel. Therefore, potential damage to the SFP from an accidental load drop would not threaten safe storage of spent fuel at TP.

The licensee's response to NRC Bulletin 96-02, "Movement of Heavy Loads Over Spent Fuel, Over Fuel in the Reactor Core, or Over Safety-Related Equipment," stated that plant procedures are used to control handling of heavy loads. The procedures identify the safe load paths defined under the Phase I implementation to satisfy NUREG-0612 guideline 5.1.1(1), which included the safe load paths in and around the fuel handling building. The safe load path of the cask area racks will traverse the cask washdown area, which was previously evaluated as the path for fuel cask handling. As part of the cask handling evaluation, the licensee had identified the potential for damaged piping associated with either the SFP cooling system (high and low suction lines) or the component cooling water system (supply and return lines to the SFP cooling system). The SFP cooling system malfunction created the potential for a partial loss of SFP water inventory and the component cooling water system malfunction created the potential for interruption of cooling to nonessential equipment. The licensee stated that restricting the cask lift elevation along the load path to 1-foot above the ground limits the damage potential and that the appropriate preventive measures were previously included in procedures. The licensee confirmed that no new safety-significant components were introduced to the safe load paths where they could be impacted by a heavy load drop.

Based on the review of the licensee's submitted information concerning the handling of heavy loads associated with this amendment request, the NRC staff finds the licensee has provided adequate assurance that its planned actions for the installation of the cask area storage racks are consistent with the "defense-in-depth" approach to safety in the handling of heavy loads described in NUREG-0612. The NRC staff concludes that the use of the spent fuel cask handling crane with the specified lifting rig in accordance with the specified procedures will enable the licensee to maintain safety during the handling of heavy loads associated with the installation of the cask area storage racks. Existing approved evaluations of potential fuel cask drop events provide assurance of defense in depth, in that a drop of the cask area fuel storage rack within the handling areas is unlikely to cause significant damage to the SFP or buried piping. Therefore, the NRC staff finds the amendment request acceptable regarding the handling of heavy loads.

3.5.2 Heavy Load Affects on Radiological Consequences

The NRC staff evaluated the potential effect of the cask area fuel storage rack addition on the existing evaluation of a postulated fuel handling accident. The new racks do not require any changes in the fuel assembly design. There are no new fuel movement pathways created by the addition of the cask area racks. Also, the frequency of fuel assembly movement will be essentially the same as without the cask area rack up to the time that the current pool capacity to accommodate a full core offload expires. Therefore, the probability of a postulated fuel

handling accident will not be increased by the addition of the cask area racks and the existing analysis remains bounding.

3.5.3 Summary

The NRC staff finds that the licensee has provided adequate assurance that its planned actions for the installation of the cask area spent fuel storage racks are consistent with the "defense-in-depth" approach to safety in the handling of heavy loads described in NUREG-0612. The NRC staff concludes that the use of the spent fuel cask handling crane with the specified lifting rig in accordance with the specified procedures will enable the licensee to maintain safety during the handling of heavy loads associated with the installation of the cask area storage racks. Finally, existing approved evaluations of potential fuel cask drop events provide assurance of defense-in-depth, in that a drop of the cask area fuel storage rack within the handling areas is unlikely to cause significant damage to the SFP or buried piping. Therefore, the NRC staff finds handling of heavy loads associated with installation and removal of the cask area racks acceptable.

3.6 Technical Specification Changes

In the submittal, the following TS changes were proposed by the licensee:

a. Section 5.6.1.1a would be revised to read:

> . . . k_{eff} equivalent to less than 1.0 when flooded with unborated water, which includes a conservative allowance for uncertainties as described in UFSAR Appendix 14D.

b. Section 5.6.1.1b would be revised to read:

> A k_{eff} equivalent to less than or equal to 0.95 when flooded with water borated to 650 ppm, which includes a conservative allowance for uncertainties as described in UFSAR Appendix 14D.

c. Section 5.6.1.1c would be revised to read:

> A nominal 10.6 inch center-to-center distance for Region I and 9.0 inch center-to-center distance for Region I for the two region spent fuel pool storage racks. A nominal 10.1 inch center-to-center distance in the east-west direction and a nominal 10.7 inch center-to-center distance in the north-south direction for the Region I cask area storage rack.

d. Section 5.6.3, Capacity, would be revised to read:

> The spent fuel storage pool racks are designed and shall be maintained with a storage capacity limited to no more than 1404 fuel assemblies in two region storage racks, and the cask area storage rack is designed and shall be maintained with a storage capacity limited to no more than 131 fuel assemblies. The total spent fuel pool storage capacity is limited to no more than 1535 fuel assemblies.

In previous sections, the NRC staff found that the analyses regarding criticality and cask area heavy loads were acceptable. As these changes support important analyses assumptions and the maintenance of full core offload capability these changes are therefore acceptable.

4.0 STATE CONSULTATION

Based upon a letter dated May 2, 2003, from Michael N. Stephens of the Florida Department of Health, Bureau of Radiation Control, to Brenda L. Mozafari, Senior Project Manager, U.S. Nuclear Regulatory Commission, the State of Florida does not desire notification of issuance of license amendments.

5.0 ENVIRONMENTAL CONSIDERATION

Pursuant to 10 CFR 51.21, 51.32, and 51.35, an Environmental Assessment and Finding of No Significant Impact has previously been prepared and published in the *Federal Register* on Ocotber 24, 2003 (68 FR 61019). Accordingly, based on the environmental assessment, the Commission has determined that the issuance of this amendment will not have a significant effect upon the quality of the human environment.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

In order to maintain the assumptions in the SFP criticality analysis and the capability to offload spent fuel to a transfer cask, this approval is subject to the following license conditions:

1. The licensee shall restrict the combined number of fuel assemblies loaded in the existing spent fuel pool storage racks and cask pit rack to no more than the capacity of the spent fuel pool storage racks. This condition applies at all times, except during activities associated with a reactor core offload/reload refueling condition. This restriction will ensure the capability to unload and remove the cask pit rack when cask loading operations are necessary.

2. The licensee shall establish two hold points within the rack installation procedure to ensure proper orientation of the cask rack in each unit's spent fuel pool. Verification of proper cask pit rack orientation will be implemented by an authorized Quality Control inspector during installation of the racks to ensure consistency with associated spent fuel pool criticality analysis assumptions.

These conditions are applicable to both units.

7.0 REFERENCES

1. Letter from J.P. McElwain (FPL) to NRC, "Proposed License Amendments, Addition of Cask Area Spent Fuel Storage Racks," dated November 26, 2002, ADAMS Accession No. ML023540521.

2. Letter from R.S. Kundalkar (FPL) to NRC, "RAI [Request for Additional Information] Response for Addition of Spent Fuel Pool Cask Area Rack Amendment," dated September 8, 2003, ADAMS Accession No. ML032580479.

3. Letter from T.O. Jones (FPL) to NRC, "Spent Fuel Pool Cask Area Rack Amendment, Clarification on RAI Response to NRC Questions 10a and 23," dated October 30, 2003.

4. Title 10 *Code of Federal Regulations* (10 CFR) Part 50 Appendix A, General Design Criteria 62, "Prevention of criticality in fuel storage and handling."

5. Title 10 CFR Section 50.68, "Criticality accident requirements."

6. Title 10 CFR Section 70.24, "Criticality accident requirements."

7. NUREG-0800, Standard Review Plan, Section 9.1.2, "Spent Fuel Storage," Draft Revision 4.

8. Proposed Revision 2 to Regulatory Guide 1.13, "Spent Fuel Storage Facility Design Basis," December 1981.

9. NRC Memorandum from L. Kopp to T. Collins, "Guidance on the Regulatory Requirements for Criticality Analysis of Fuel Storage at Light-Water Reactor Power Plants," dated August 19, 1998.

10. Title 10 of the CFR Section 50.59, "Changes, tests, and experiments."

11. Letter from K.N. Jabbour (NRC) to T.F. Plunkett (FPL), "Turkey Point Units 3 and 4 - Issuance of Amendments Regarding Boron Credit in the Spent Fuel Pool (TAC Nos. MA7262 and MA7263)," dated July 19, 2000, ADAMS Accession No. ML003734501.

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Date: November 24, 2004

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TURKEY POINT PLANT

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