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DOCTYPE: LETTER NOTARIZED: YES

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SUBJECT:
FORWARDING LIC NOS DPR-31 & 41 APPL FOR AMEND: TECH SPEC PROPOSED CHANGE CONCERNING REMOVAL OF THE PART-LENGTH ROD CLUSTER CONTROL ASSEMBLIES AND INSTALLATION OF THIMBLE PLUG ASSEMBLIES IN LOCATIONS PREVIOUSLY OCCUPIED BY THE PLRCCA"S... NOTARIZED 08/09/78.

PLANT NAME: TURKEY PT #3
TURKEY PT #4

REVIEWER INITIAL: XJM
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FPL
FLORIDA POWER & LIGHT COMPANY

August 9, 1978
L-78-263



Director of Nuclear Reactor Regulation
Attention: Mr. Victor Stello, Jr., Director
Division of Operating Reactors
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Stello:

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
Proposed Amendment to Facility
Operating Licenses DPR-31 and DPR-41

In accordance with 10 CFR 50.30, Florida Power & Light Company (FPL) submits herewith three (3) signed originals and forty (40) copies of a request to amend Appendix A of Facility Operating Licenses DPR-31 and DPR-41.

The purpose of this proposed amendment is to delete the requirements for Part-Length Rod Cluster Control Assemblies (PLRCCA's) from the Technical Specifications for Turkey Point Units 3 and 4. Because of the requirement to maintain the PLRCCA's fully withdrawn and non-scrammable, plant operation at full power is not allowed with the PLRCCA's in the core. FPL plans to remove the PLRCCA's at Turkey Point Units 3 and 4 during their respective refueling outages. Thimble Plug Assemblies will be installed in to the locations previously occupied by the PLRCCA's to preserve the current dynamic operating characteristics of the Reactor. We request that our proposal be approved to support startup following the upcoming refueling of Turkey Point Unit 4.

The proposed amendment is described below and shown on the accompanying Technical Specification pages bearing the date of this letter in the lower right hand corner.

A footnote, specifying that any reference to part-length rods no longer applies after the part-length rods are removed from the reactor, has been added to the following pages:

Page 3.2-1
Page 3.2-2
Page 5.2-1
Page 5.2-2
Page B2.1-2
Page B3.2-1a
Page B3.2-2
Page B3.2-6
Page B3.2-7



A001 S 3/40

In accordance with the criteria stated in 10 CFR 170.22, FPL has determined that this is a Class III Amendment. A check in the amount of $4,000 to cover the requisite amendment fee is enclosed.

Deletion of the PLRCCA's has been requested by a number of Westinghouse plants.

The proposed amendment has been reviewed by the Turkey Point Plant Nuclear Safety Committee and the Florida Power & Light Company Nuclear Review Board. They have concluded that it does not involve an unreviewed safety question. In addition, removal of part length rods has been approved for several operating reactors. A Safety Evaluation is attached.

Very truly yours,

Robert E. Uhrig

Robert E. Uhrig
Vice President

REU/MAS/RL/cpc

Attachment

cc: Mr. James P. O'Reilly, Region II
Robert Lowenstein, Esquire

## 3.2 CONTROL ROD AND POWER DISTRIBUTION LIMITS

<u>Applicability</u>: Applies to the operation of the control rods and power distribution limits.

<u>Objective</u>: To ensure (1) core subcriticality after a reactor trip, (2) a limit on potential reactivity insertions from a hypothetical control rod ejection, and (3) an acceptable core power distribution during power operation.

<u>Specification</u>:

1. <u>CONTROL ROD INSERTION LIMITS</u>

   a. Whenever the reactor is critical, except for physics tests and control rod exercises, the shutdown control rods shall be fully withdrawn.

   b. For Unit 4, whenever the reactor is critical, except for physics tests and control rod exercises, the control group rods shall be no further inserted than the limits shown on Figure 3.2-1 for three loop operation and on Figure 3.2-1(a) for two loop operation.

   c. For Unit 3, whenever the reactor is critical, except for physics tests and control rod exercises, the control group rods shall be no further inserted than the limits shown on Figure 3.2-1(b) for three loop operation and on Figure 3.2-1(c) for two loop operation.

   d. The Unit 4 control rod insertion limits shown on Figure 3.2-1 and the Unit 3 control rod insertion limits shown on Figure 3.2-1(b) may be revised on the basis of physics calculations and physics data obtained during startup and subsequent operation.

   e.* Part length rods shall not be permitted in the core except for low power physics tests and for axial offset calibration tests performed below 75% of rated power.

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* Any reference to part-length rods no longer applies after the part-length rods are removed from the reactor.

f. Except for low power physics tests, the shutdown margin with allowance for a stuck control rod shall exceed the applicable value shown on Figure 3.2-2 under all steady-state operating conditions from zero to full power, including effects of axial power distribution. The shutdown margin as used here is defined as the amount by which the reactor core would be subcritical at hot shutdown conditions (540 F) if all control rods were tripped, assuming that the highest worth control rod remained fully withdrawn, and assuming no changes in xenon, boron concentration or part-length rod position.

g. During physics tests and control rod exercises, the insertion limits need not be met, but the required shutdown margin, Figure 3.2-2 must be maintained or exceeded.

2. MISALIGNED CONTROL ROD

If a part length* or full length control rod is more than 15 inches out of alignment with its bank, and is not corrected within 8 hours power shall be reduced so as not to exceed 75% of interim power for 3 loop or 45% of interim power for two loop operation, unless the hot channel factors are shown to be no greater than allowed by Section 6a of Specification 3.2.

3. ROD DROP TIME

The drop time of each control rod shall be no greater than 1.8 seconds at full flow and operating temperature from the beginning of rod motion to dashpot entry.

4. INOPERABLE CONTROL RODS

a. No more than one inoperable control rod shall be permitted during sustained power operation, except it shall not be permitted if the rod has a potential

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* Any reference to part-length rods no longer applies after the part-length rods are removed from the reactor.

## 5.2 REACTOR

### REACTOR CORE

1. The reactor core contains approximately 71 metric tons of uranium in the form of slightly enriched uranium dioxide pellets. The pellets are encapsulated in Zircaloy - 4 tubing to form fuel rods. The reactor core is made up of 157 fuel assemblies. Each fuel assembly contains 204 fuel rods.

2. The average enrichment of the initial core is a nominal 2.50 weight per cent of U-235. Three fuel enrichments are used in the initial core. The highest enrichment is a nominal 3.10 weight per cent of U-235.

3. Reload fuel will be similar in design to the initial core. The enrichment of reload fuel will be no more than 3.5 weight per cent of U-235.

4. Burnable poison rods are incorporated in the initial core. There are 816 poison rods in the form of 12-rod clusters, which are located in vacant rod cluster control guide tubes. The burnable poison rods consist of borated pyrex glass clad with stainless steel.

5. There are 45 full-length RCC assemblies and 8 partial-length* RCC assemblies in the reactor core. The full-

* Any reference to part-length rods no longer applies after the part-length rods are removed from the reactor.

length RCC assemblies contain a 144 inch length of silver-indium-cadmium alloy clad with the stainless steel. The partial-length* RCC assemblies contain a 36 inch length of silver-indium-cadmium alloy with the remainder of the stainless steel sheath filled with $Al_2O_3$.

6. Up to 10 grams of enriched fissionable material may be used either in the core, or available on the site, in the form of fabricated neutron flux detectors for the purposes of monitoring core neutron flux.

REACTOR COOLANT SYSTEM

1. The design of the Reactor Coolant System complies with the code requirements.

2. All piping, components and supporting structures of the Reactor Coolant System are designed to Class I requirements, and have been designed to withstand:

   a. The design seismic ground acceleration, 0.05g acting in the horizontal and 0.033g acting in the vertical planes simultaneously, with stresses maintained within code allowable working stresses.

   b. The maximum potential seismic ground acceleration, 0.15g, acting in the horizontal and 0.10g acting in the vertical directions simultaneously with no loss of function.

3. The nominal liquid volume of the Reactor Coolant System, at rated operating conditions, is 9088 cubic feet.

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* Any reference to part-length rods no longer applies after the part-length rods are removed from the reactor.

Use of these factors results in more conservative curves than if the Interim Limits were used.

These limiting hot channel factors are higher than those calculated at full power for the range from all control rods fully withdrawn to maximum allowable control rod insertion. The control rod insertion limits are covered by Specification 3.2. Slightly higher hot channel factors could occur at lower power levels because additional control rods are in the core. However, the control rod insertion limits dictated by Figure 3.2-1 ensure that the DNBR is always greater at partial power than at full power.

The hot channel factors are also sufficiently large to account for the degree of malpositioning of part-length* rods that is allowed before the reactor trip set points are reduced and rod withdrawal block and load runback may be required.[1] Rod withdrawal block and load runback occur before reactor trip setpoints are reached.

The Reactor Control and Protection System is designed to prevent any anticipated combination of transient conditions that would result in a DNBR of less than 1.30.[2]


Reference

(1) FSAR 3.2.2

(2) FSAR 14.1.1


* Any reference to part-length rods no longer applies after the part-length rods are removed from the reactor.

The overlap between successive control banks is allowed because the control rod worth is lower near the top and bottom of the core than in the center.

Positioning of the part-length* rods is governed by the requirement to maintain the axial power shape within specified limits or to accept an automatic cutback of the overpower ΔT and overtemperature ΔT set points (see Specification 2.3). Thus, there is no need for imposing a limit on the physical positioning of the part-length rods.

* Any reference to part-length rods no longer applies after the part-length rods are removed from the reactor.

The various control rod banks are each to be moved as a bank, that is, with all rods in the bank within one step (5/8 inch) of the bank position. The control system is designed to permit individual rod movement for test purposes. Position indication is provided by two methods: a digital count of actuating pulses which shows the demand position of the banks and a linear position indicator (LVDT) which indicates the actual rod position.(2) The relative accuracy of the linear position indicator (LVDT) is such that, with the most adverse error, an alarm will be actuated if any two rods within a bank deviate by more than 15 inches. In the event that an LVDT is not in service, the effects of a malpositioned control rod are observable on nuclear and process information displayed in the control room and by core thermocouples and in-core movable detectors. Complete rod misalignment (part-length* or full-length control rod 12 feet out of alignment with its bank) does not result in exeeding core limits in steady-state operation at rated power. If the condition cannot be readily corrected, the specified reduction in power to 75% (3 loop) or 45% (2 loop) will insure that design margins to core limits will be maintained under both steady-state and anticipated transient conditions. The 8-hour permissible limit on rod misalignment is short with respect to the probability of an independent accident. The 24-hour period ensures that no significant burnup effects would be caused by the inserted rod.

The specified rod drop time is consistent with safety analyses that have been performed.(1)

The In-Core Instrumentation has five drives with detectors each of which has ten thimbles assigned.(3) This provides broad capability for detailed flux mapping.

The ion chambers located outside the reactor vessel measure flux distribution at the top and bottom of the core. Core traverses in a few of the in-core instrument paths will establish that the fixed flux measurement equipment is properly calibrated.

Operating experience has established that the flux measurement system is of a reliable design, and that the 10% load reduction, in the event of recalibration delay, is ultra conservative compensation.

References:

(1) FSAR - Section 14

(2) FSAR - Section 7.2

(3) FSAR - Section 7.6

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* Any reference to part-length rods no longer applies after the part-length rods are removed from the reactor.

Flux Difference (Δϕ) and a reference value which corresponds to the full design power equilibrium value of Axial Offset (Axial Offset = Δϕ/fractional power). The reference value of flux difference varies with power level and burnup but expressed as axial offset it varies only with burnup.

The technical specifications on power distribution control assure that the $F_q$ upper bound envelope of 2.22* times Figure 3.2-3 is not exceeded and xenon distributions are not developed which at a later time, would cause greater local power peaking even though the flux difference is then within the limits specified by the procedure.

The target (or reference) value of flux difference is determined as follows. At any time that equilibrium xenon conditions have been established, the indicated flux difference is noted with part length+ rods withdrawn from the core and with the full length rod control rod bank more than 190 steps withdrawn (i.e., normal rated power operating position appropriate for the time in life. Control rods are usually withdrawn farther as burnup proceeds). This value, divided by the fraction of design power at which the core was operating is the design power value of the target flux difference. Values for all other core power levels are obtained by multiplying the design power value by the fractional power. Since the indicated equilibrium value was noted, no allowances for excore detector error are necessary and indicated deviation of ±5% ΔI are permitted from the indicated reference value. During periods where extensive load following is required, it may be impractical to establish the required core conditions for measuring the target flux difference every rated power month. For this reason, methods are permitted by Item 6c of Section 3.2 for updating the target flux differences. Figure B3.2-1 shows a typical construction of the target flux difference band at BOL and Figure B3.2-2 shows the typical variation of the full power value with burnup.

Strict control of the flux difference (and rod position) is not as necessary during part power operation. This is because xenon distribution control at part power is not as significant as the control at full power and allowance has been made in predicting the heat flux peaking factors for less strict control at part power. Strict control of the flux difference is not possible during certain physics tests or during the required, periodic excore calibra-

*For steam generator tube plugging in excess of 10%, this value becomes 2.20.

+ Any reference to part-length rods no longer applies after the part-length rods are removed from the reactor.

tions which require larger flux differences than permitted. Therefore, the specifications on power distribution control are not applied during physics tests or excore calibration. This is acceptable due to the extremely low probability of a significant accident occurring during these operations.

In some instances of rapid plant power reduction automatic rod motion will cause the flux difference to deviate from the target band when the reduced power level is reached. This does not necessarily affect the xenon distribution sufficiently to change the envelope of peaking factors which can be reached on a subsequent return to full power within the target band. However, to simplify the specification, a limitation of one hour in any period of 24 hours is placed on operation outside the band. This ensures that the resulting xenon distributions are not significantly different from those resulting from operation within the target band. The instantaneous consequences of being outside the band, provided rod insertion limits are observed, is not worse than a 10 percent increment in peaking factor for flux difference in the range +14% to -14% (+11% to -11% indicated) increasing by ± 1% for each 2% decrease in rated power. Therefore, while the deviation exists, the power level is limited to 90% of design power or lower depending on the indicated flux difference.

If, for any reason, flux difference is not controlled within the ±5% band for as long a period as one hour, then xenon distributions may be significantly changed and operation at 50% of design power is required to protect against potentially more severe consequences of some accidents.

As discussed above, the essence of the procedure is to maintain the xenon distribution in the core as close to the equilibrium full power condition as possible. This can be accomplished without part length* rods by using the boron system to position the full length control rods to produce the required indicated flux difference.

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* Any reference to part-length rods no longer applies after the part-length rods are removed from the reactor.

SAFETY EVALUATION

REMOVAL OF PART LENGTH CONTROL ELEMENT ASSEMBLIES

FROM TURKEY POINT UNITS NO. 3 AND 4

## I. INTRODUCTION

This report provides information to justify plant operation following the removal of the part-length rod cluster control assemblies (PLRCCA's). Plant operation at power is currently not allowed with PLRCCA's in the core.

Thimble plug assemblies will be installed into the locations previously occupied by the PLRCCA's. These plugs are being installed to preserve the current dynamic operating characteristic of the reactor, i.e., pressure drops, coolant flow rates, etc., which could be affected if just removal of the PLRCCA's was performed.

## II. THIMBLE PLUG ASSEMBLY MECHANICAL DESIGN

The Thimble Plug Assembly, which will be inserted into locations previously occupied by PLRCCA's, consists of a flat base plate with short rods suspended from the bottom surface and a spring pack assembly. The twenty short rods, called thimble plugs, project into the upper ends of the guide thimbles to reduce the bypass flow area. Fuel assemblies without control rods, burnable poison rods, or source rods use identical devices. Similar short rods are also used on the source assemblies and fuel assembly guide thimbles. At installation in the core, the thimble plug assemblies interface with both the upper core plate and with the fuel assembly top nozzles by resting on the adapter plate. The spring pack is compressed by the upper core plate when the upper internals assembly is lowered into place. Each thimble plug is permanently attached to the base plate by a nut which is locked to the threaded end of the plug by a pin welded to the nut.

All components in the thimble plug assembly, except for the springs, are constructed from type 304 stainless steel. The springs are wound from Inconel x-750 for corrosion resistance and high strength.

These thimble plugs will effectively limit bypass flow through the rod cluster control guide thimbles in the fuel assemblies from which the PLRCCA's have been removed, just as they currently limit bypass flow in those assemblies which

do not contain control rods, source rods, or burnable poison rods.

## III. THERMAL HYDRAULIC EFFECTS

### A. Thermal Effects

Physics analysis, as well as incore monitoring, indicates that there will be no adverse effect of the plug assemblies on the core power distribution. Since the plugged fuel assemblies have no adverse effect on the design core flow distribution, calculated core thermal margin will be unaffected.

### B. Hydraulic Effects

Hydraulic aspects were considered with respect to the installation of the thimble plug assemblies. Since the plug assemblies are already extensively used in existing fuel assemblies with no adverse effects, it can be concluded that there will be no adverse effects from the installation of these additional thimble plugs.

## IV. NEUTRONICS EFFECTS

The removal of part length rods has no impact on any physics information generated in the past for Turkey Point No. 3 & 4. The use of part length RCCA's has been prohibited by Technical Specifications and they have been locked in the full out position during operation. The installation of thimble plug assemblies as described in Sections II and III will have no influence on the physics characteristics of the reactor. The lowest portion of the plug assemblies will not be within several inches of the top of the fuel. Therefore, operation with installed plugs will not invalidate any of the physics parameters.

## V. ACCIDENT AND TRANSIENT ANALYSES

Based on foregoing discussion, the following conclusions relating to accident and transient analyses can be reached.

### A. Impact on Probability of Occurrence

A potential safety concern is that the probability of some event previously analyzed can be increased due to the replacement of PLRCCA's with thimble plug assemblies. No information exists which suggests that the replacement of PLRCCA's with thimble plug assemblies increases the probability of any event previously analyzed.

B. Other Malfunctions Not Previously Analyzed

No information exists which suggests that the replacement of PLRCCA's with thimble plug assemblies introduces a possibility for an accident or any malfunction of a different type than those previously analyzed. Hence, it is concluded that the replacement of PLRCCA's with plugs does not introduce the possibility of events not previously analyzed.

C. Margin of Safety

It is evaluated that the consequences of replacing the PLRCCA's with thimble plug assemblies does not reduce the margin of safety, as defined in the bases for applicable technical specifications.

D. Summary

The probability of occurrence of events has not increased and the consequences of these events remain within those reported in previous analyses. The possibility of other types of accidents or malfunctions has not increased. Hence, the information presented in this report leads to the conclusion that operation of Turkey Point No. 3 & 4 with the thimble plug assemblies instead of PLRCCA's does not present any danger to the health and safety of the public.

VI. TECHNICAL SPECIFICATION CHANGES

As a result of removal of PLRCCA's, the following Unit 3 & 4 technical specifications must be revised as indicated on the attached sheets.

1. Section 3.2.1
2. Section 3.2.2
3. Section 5.2
4. Bases 2.1
5. Bases 3.2

STATE OF FLORIDA )
) SS
COUNTY OF DADE )

Robert E. Uhrig, being first duly sworn, deposes and says:

That he is a Vice President of Florida Power & Light Company, the Applicant herein:

That he has executed the foregoing document; that the statements made in this said document are true and correct to the best of his knowledge, information and belief, and that he is authorized to execute the document on behalf of said Applicant.

Robert E. Uhrig

Robert E. Uhrig

Subscribed and sworn to before me

this 9th day of August, 1978

Betty Brittain

NOTARY PUBLIC, in and for the County of Dade,
State of Florida

My commission expires: NOTARY PUBLIC STATE OF FLORIDA at LARGE MY COMMISSION EXPIRES MARCH 27, 1982 BONDED THRU MAYNARD BONDING AGENCY