

DISTRIBUTION

Docket	BHarless
NRC PDR	DEisenhut
Local PDR	OPA - Clare Miles
ORB #2 Reading	DRoss
VStello	TBAbernthy
KRGoller	JRBuchanan
TJCarter	ACRS (16)
DLZiemann	
RDSilver	
EAREeves	
RMDiggs	
OELD	
OI&E (5)	
BJones (4)	
BScarf (16)	
JMcGough	

Docket No. 50-335

FEB 18 1977

Florida Power & Light Company
 ATTN: Dr. Robert E. Uhrig
 Vice President
 Nuclear and General Engineering
 Post Office Box 013100
 Miami, Florida 33101

Gentlemen:

The Commission has issued the enclosed Amendment No. 13 to Facility Operating License No. DPR-67 for the St. Lucie Plant Unit No. 1. The amendment consists of a revision to License No. DPR-67 in response to your applications dated July 9, 1976, and January 5, 1977, and supplements dated December 21, 1976, and February 1, 1977.

The amendment (1) terminates NRC's June 17, 1976 "Order for Modification of License" which had placed an interim power restriction of 90% of full power, an interim restriction on peak linear heat generation rate of 12.7 kW/ft and interim restrictions related to reactor coolant flow rate, (2) authorizes 100% power operation, (3) revises the peak linear heat generation rate limit in Technical Specifications to 14.8 kW/ft, and (4) reinstates Technical Specification limits based on a reactor coolant flow rate of 370,000 gpm.

Copies of the related Safety Evaluation and the Notice of Issuance are also enclosed.

Sincerely,

Original signed by
 Dennis L. Ziemann

Dennis L. Ziemann, Chief
 Operating Reactors Branch #2
 Division of Operating Reactors

Enclosures:

- Amendment No. 13 to License No. DPR-67
- Safety Evaluation
- Notice

I informed FPL on 2/18/77 5:10 PM that amendment has been issued. R. Silver
E.K. Noted 2/18/77

cc w/enclosures:
 See next page

~~DOR:AD/OT
 DEisenhut~~
R. Silver

OFFICE →	DOR:ORB #2	DOR:ORB #2	OELD	DOR:ORB #2	STS <i>DLZ</i>	DOR:RSB/OT
SURNAME →	<i>RMDiggs</i>	RDSilver:ro	<i>E. Ketcher</i>	DLZiemann	JMcGough <i>f</i>	RBaer
DATE →	<i>2/18/77</i>	<i>2/18/77</i>	<i>1/1</i>	<i>2/18/77</i>	<i>2/18/77</i>	<i>1/1</i>

February 18, 1977

cc w/enclosures:

Jack R. Newman, Esquire
Lowenstein, Newman, Reis & Axelrad
1025 Connecticut Avenue, N. W.
Washington, D. C. 20036

Norman A. Coll, Esquire
McCarthy, Steel, Hector & Davis
14th Floor, First National Bank Building
Miami, Florida 33131

Mr. John L. McQuigg
Post Office Box 1408
Stuart, Florida 33494

Indian River Junior College Library
3209 Virginia Avenue
Ft. Pierce, Florida 33450

Mr. Bruce Blanchard
Environmental Projects Review
Department of the Interior
Room 5321
18th and C Streets, N. W.
Washington, D. C. 20240

U. S. Environmental Protection Agency
Region IV Office
ATTN: EIS COORDINATOR
345 Courtland Street, N. E.
Atlanta, Georgia 30308

Chief, Energy Systems Analyses
Branch (AW-459)
Office of Radiation Programs
U. S. Environmental Protection Agency
Room 645, East Tower
401 M Street, S. W.
Washington, D. C. 20460

Weldon B. Lewis
County Administrator
St. Lucie County
Post Office Box 700
Ft. Pierce, Florida 33450

cc w/enclosures and cy of
FP&L filings dtd. 7/9/76,
12/21/76, 1/5/77, & 2/1/77:
Bureau of Intergovernmental
Relations
660 Apalachee Parkway
Tallahassee, Florida 32304

Hamilton Oven, Jr., Administrator
Department of Environmental
Regulation
Power Plant Siting Section
State Of Florida
Montgomery Building
2562 Executive Center Circle, E.
Tallahassee, Florida 32301



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

FLORIDA POWER & LIGHT COMPANY

DOCKET NO. 50-335

ST. LUCIE PLANT UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 13
License No. DPR-67

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The applications for amendment by Florida Power & Light Company (the licensee) dated July 9, 1976, and January 5, 1977, as supplemented by letters dated December 21, 1976, and February 1, 1977, comply 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.

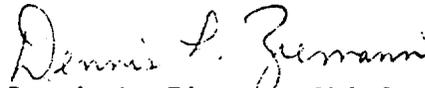
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C(2) of Facility License No. DPR-67 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 13, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION


Dennis L. Ziemann, Chief
Operating Reactors Branch #2
Division of Operating Reactors

Attachment:
Changes to the Technical
Specifications

Date of Issuance: February 18, 1977

ATTACHMENT TO LICENSE AMENDMENT NO. 13

FACILITY OPERATING LICENSE NO. DPR-67

DOCKET NO. 50-335

Replace the following page of the Appendix "A" Technical Specifications with the enclosed page. The revised page is identified by Amendment number and contains vertical lines indicating the area of change. The corresponding overleaf page 3/4 2-4 is also provided to maintain document completeness. No changes were made on 3/4 2-4.

Page

3/4 2-3

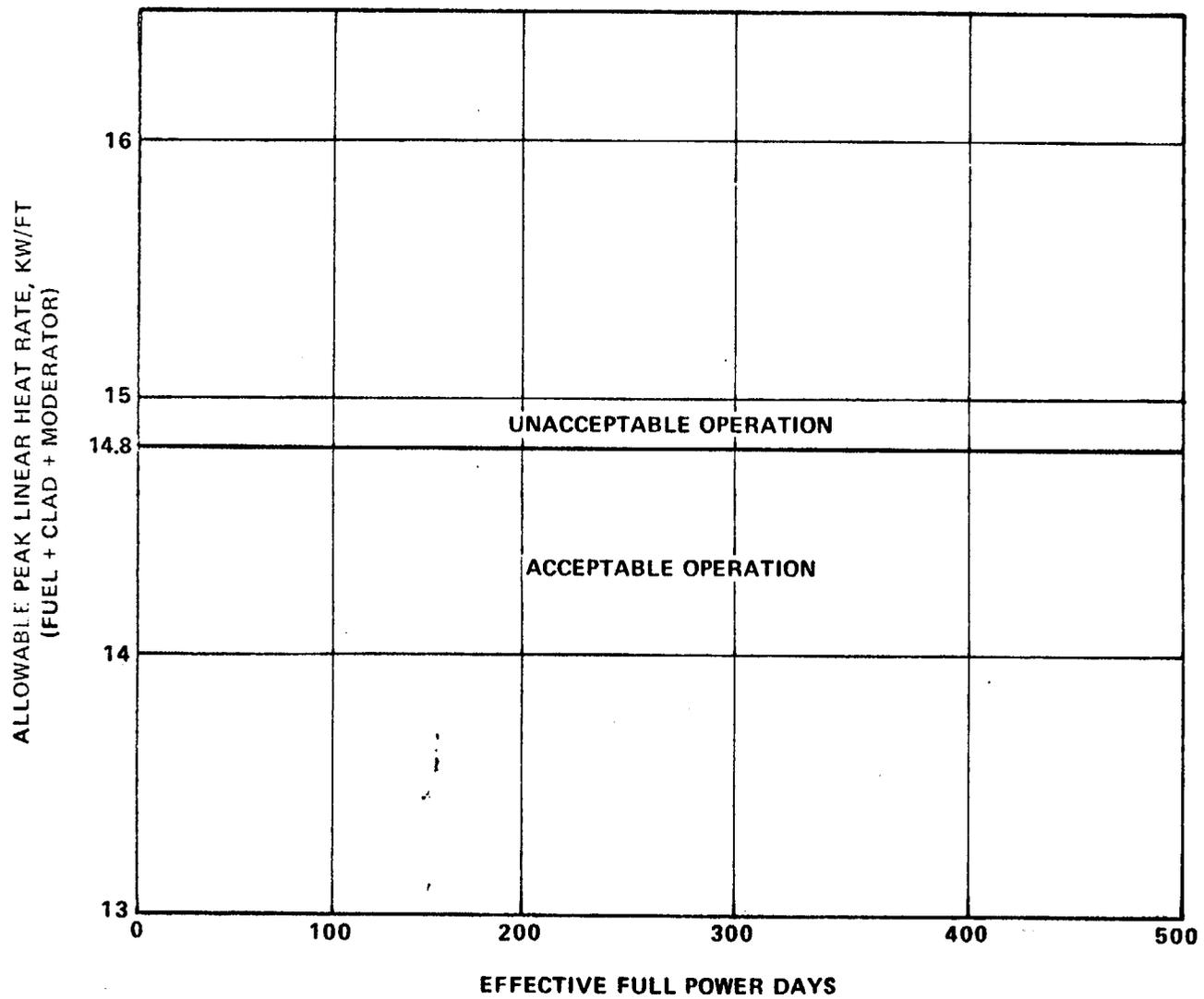


Figure 3.2-1 Allowable Peak Linear Heat Rate vs Burnup

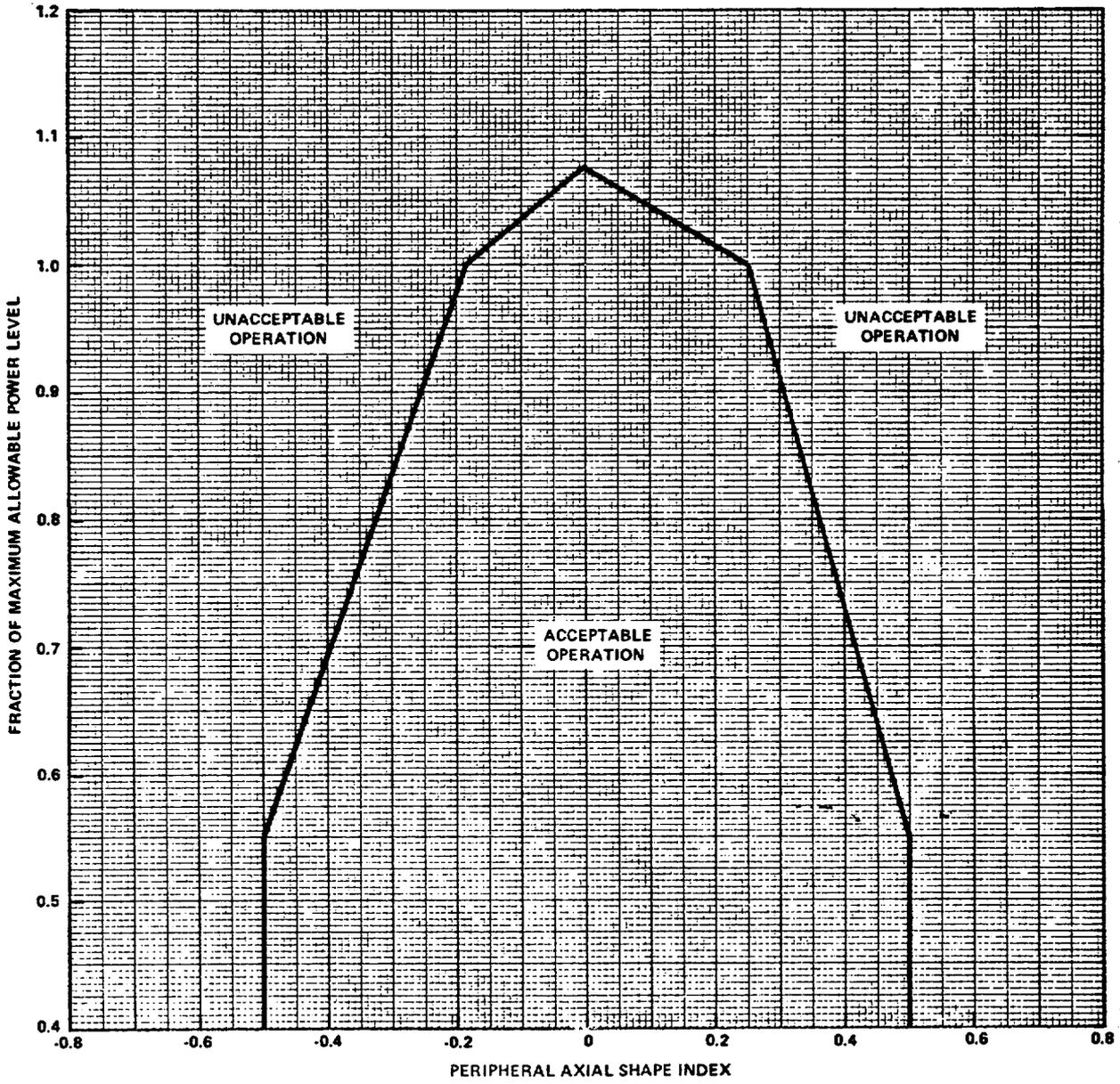


Figure 3.2-2
 AXIAL SHAPE INDEX vs Fraction of Maximum Allowable
 Power Level per Specification 4.2.1.3



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 13 TO LICENSE NO. DPR-67

FLORIDA POWER & LIGHT COMPANY

ST. LUCIE PLANT UNIT NO. 1

DOCKET NO. 50-335

INTRODUCTION

By applications dated July 9, 1976, and January 5, 1977, and supplements dated December 21, 1976, and February 1, 1977, Florida Power & Light Company (FPL) requested amendments to the St. Lucie Plant Unit No. 1 license which would: (1) terminate NRC's June 17, 1976 "Order for Modification of License" which placed an interim power restriction of 90% of full power, an interim restriction in peak linear heat generation rate of 12.7 kW/ft and interim restrictions related to reactor coolant flow rate, (2) authorize 100% power operation, (3) revise the peak linear heat generation rate limit in Technical Specifications to 14.8 kW/ft, and (4) reinstitute Technical Specification limits based on a reactor coolant flow rate of 370,000 gpm.

DISCUSSION

Corrected ECCS Performance Evaluation

In the staff's Safety Evaluation Report supporting issuance of an operating license, our review of the emergency core cooling system (ECCS) performance evaluation for St. Lucie Unit No. 1 was documented. In addition to the LOCA, our review also addressed the specific areas of rod bowing effects, minimum containment pressure, single failure criterion, effect of boric acid concentration on long term cooling capability and submerged valves. As a result of our review, we concluded that the ECCS performance of St. Lucie Unit No. 1 would be in conformance with the acceptance criteria of 10 CFR Part 50.46 provided that the peak linear heat generation rate (PLHGR) did not exceed 15.8 kilowatts per foot (kW/ft).

In June, 1976,⁽¹⁾ the licensee (Florida Power & Light Company) informed the staff that an internal audit of the Combustion Engineering loss-of-coolant accident (LOCA) heatup code, STRIKIN-II, had disclosed several errors in coding. This code has been used in the LOCA analysis described above for the St. Lucie Unit No. 1 plant. After discussing the nature of the errors with the staff, Combustion Engineering made corrections to the STRIKIN-II code, and a revised ECCS analysis was performed for the previously determined worst break case for St. Lucie Unit No. 1. The corrected analysis indicated that a PLHGR of 13.7 kW/ft was then appropriate for this plant. However, the staff concluded that the PLHGR should be reduced an additional 1 kW/ft (to 12.7 kW/ft) until a more complete break spectrum was submitted and until the plant calculations and the STRIKIN-II model corrections were reviewed and determined to be acceptable. The 12.7 kW/ft PLHGR limitation was documented by the issuance of an Order for Modification of License on June 17, 1976.⁽²⁾

The corrections to the STRIKIN-II code were documented by Combustion Engineering in August, 1976⁽³⁾, and the staff review and approval of the corrections are described in an amendment to the Status Report issued in October, 1976.⁽⁴⁾

Using the corrected and approved version of STRIKIN-II, a final revised LOCA analysis was performed for St. Lucie Unit No. 1 at a PLHGR of 14.8 kW/ft. The analysis with corresponding proposed Technical Specification changes was submitted to the staff by letters dated July 9, 1976⁽⁵⁾, and February 1, 1977⁽⁶⁾. In accordance with the

-
1. St. Lucie Unit No. 1 ECCS Coding Errors, letter to D. L. Ziemann from R. E. Uhrig, June 14, 1976.
 2. St. Lucie Unit No. 1 Order for Modification of License, letter to R. E. Uhrig from D. L. Ziemann, June 17, 1976.
 3. Supplement 4-P to CENPD-135, STRIKIN-II, August, 1976.
 4. Amendment No. 1 to the Status Report by the Directorate of Licensing in the Matter of Combustion Engineering, Inc. ECCS Evaluation Model Conformance to 10 CFR 50, Appendix K, October, 1976.
 5. St. Lucie Unit No. 1 Revised LOCA Analysis and Proposed Revisions to Technical Specifications, letter to V. Stello from R. E. Uhrig, July 9, 1976.
 6. St. Lucie Unit No. 1 Revised LOCA Analysis, letter to D. L. Ziemann from R. E. Uhrig, February 1, 1977.

requirements stated in Appendix K to 10 CFR Part 50, the final revised calculation for the worst break was performed such that return to nucleate boiling was not allowed during blowdown once the model predicted critical heat flux.

The corrected analysis included a large break spectrum of six breaks in which return to nucleate boiling was allowed.⁽⁵⁾ Based upon the results of these analyses, the worst break - the double ended split break located in the pump discharge and having a Moody discharge coefficient of 0.8 (0.8 DES/PD) was reanalyzed for the case where return to nucleate boiling was not allowed⁽⁶⁾. Previous analyses applicable to St. Lucie Unit No. 1 have shown that small breaks and large breaks occurring in locations other than the cold leg pump discharge are never limiting.

We conclude that the break spectrum included in the St. Lucie Unit No. 1 corrected ECCS analysis is acceptable.

Table 1 summarizes the results of the corrected ECCS calculations for the limiting fuel rod at a PLHGR of 14.8 kW/ft.

TABLE 1

RESULTS OF CORRECTED ECCS CALCULATIONS

<u>Break</u>	<u>Peak Clad Temperature</u>	<u>Local Clad Oxidation</u>	<u>Hydrogen Generation</u>	<u>Return To Nucleate Boiling</u>
0.8 DES/PD	2181°F	13.1%	<0.795%	Yes
0.8 DES/PD	2157°F	12.9%	<0.791%	No

As indicated in Table 1, the predicted values of peak clad temperature, local clad oxidation, and hydrogen generation are below their respective limits of 2200°F, 17 percent, and 1 percent which are specified in 10 CFR 50.46(b).

The net reduction in peak clad temperature, clad oxidation, and hydrogen generation indicated for the last calculation is due to two additional model and input changes. The first change was a model change which delayed entry of steam into the ruptured node until after the occurrence of the blowdown peak temperature as is discussed and approved in Reference 4. Secondly, credit for 500 MWD/MTU of fuel burnup was taken

in the determination of the steady-state gap conductance and initial fuel stored energy. Since fuel burnup is beyond 500 MWD/MTU, the credit taken for burnup is conservative. We concur that the above calculation changes are acceptable.

In our Safety Evaluation Report supporting issuance of an operating license for St. Lucie Unit No. 1, we stated that a 5% penalty on the total peaking factor would be applied to account for the effect of fuel rod bowing on fuel rod and poison shim rod behavior until additional information regarding this effect was submitted by the licensee.

The effect of fuel rod bowing on fuel rod and poison shim rod behavior has not been explicitly included in the St. Lucie Unit No. 1 corrected ECCS analysis. However, the subject of the effects of fuel rod bowing on Combustion Engineering 14 x 14 fuel, such as that used in St. Lucie Unit No. 1, is discussed generically in a letter submitted to the Nuclear Regulatory Commission by Combustion Engineering. In the letter, Combustion Engineering states its position that the uncertainty factors which are presently applied to the Combustion Engineering 14 x 14 fuel are sufficiently large to account for the effects of rod bowing. These uncertainty factors are the 8% factor applied for nuclear power distribution measurement uncertainty and the 3% engineering factor uncertainty.

We have reviewed the generic rod bowing information submitted by Combustion Engineering and it is our conclusion that the uncertainty factors which are presently included in the safety analysis for St. Lucie Unit No. 1, and which are described above, are sufficient to account for rod bowing effects.

A staff review was initiated to confirm the licensee's capability to detect and isolate a leak equivalent to a pump seal failure in the ECCS while in the post LOCA recirculation mode. An undetected leak could eventually affect long term cooling capability due to the resulting loss of cooling water inventory. The licensee's design provides for

-
7. Fuel and Poison Rod Bowing Effects in Combustion Engineering Fuel, letter to D. F. Ross from A. E. Scherer, July 16, 1976.

individual ECCS pump rooms which contain fully redundant equipment. A water level alarm system provides an alarm in the control room in the event of compartment flooding. We conclude that this design meets our requirements regarding passive failures during long term cooling.

As a result of our review, we conclude that the St. Lucie Unit No. 1 performance will conform to the peak clad temperature, maximum oxidation and hydrogen generation, coolable geometry, and long term cooling criteria of 10 CFR 50.46(b) and is therefore acceptable.

Technical Specification Modifications Related to Corrected ECCS Evaluation

Corresponding to the results of the corrected ECCS calculations described above, the licensee submitted a proposed change to the St. Lucie Unit No. 1 Technical Specifications.⁽⁵⁾ The proposed change increases the allowable peak linear heat generation rate from the interim limit of 12.7 kW/ft to 14.8 kW/ft shown in Figure 3.2-1 on page 3/4 2-3 of the Technical Specifications.

Based on our review of the corrected ECCS calculations, we conclude that the proposed Technical Specification modification is acceptable.

Calorimetric Primary Flow Determination

By letter dated December 21, 1976⁽⁸⁾, the licensee, Florida Power & Light Company (FP&L), submitted an evaluation of reactor coolant system flow rate at St. Lucie Unit No. 1 based on calorimetric methods. Previous flow determinations, based on pressure differential measurements indicated that actual flow was less than design flow. As a result, we restricted power at St. Lucie Unit No. 1 to 90% of rated power by an Order dated June 17, 1976.⁽²⁾ In the safety evaluation accompanying that Order, we required that a detailed calorimetric determination of flow, including an error analysis, be provided for our consideration. The December 21 letter provides a detailed description of the technique, including an error analysis, which indicates that flow is greater than design flow. FPL has therefore requested that the power restrictions based on flow be removed.

8. St. Lucie Unit No. 1 Reactor Coolant System Flow, letter to D. L. Ziemann from R. E. Uhrig, December 21, 1976.

Reactor coolant (primary) mass flow rate is determined by relating the measured coolant temperature differential across the core to the known core thermal output. The core thermal output is determined by performing a calorimetric heat balance for the secondary system using measured values of feedwater flow and inlet and outlet temperature. The licensee states in the December 21, 1976 letter that Combustion Engineering has concluded from measurements taken at its plants that due to the calorimetric technique's independence from geometric variations in Reactor Coolant Pump casings and internals, it is intrinsically more accurate than the pump differential pressure technique of flow determination. It is also stated that Combustion Engineering recommends that the pump differential method only be used for initial low power flow evaluations and that final, confirming flows should be verified through calorimetric methods.

A statistical error analysis was performed which assumed conservative values for each of the measured parameters used in determining the primary mass flow rate. The parameters for which errors were considered were core thermal power, hot and cold leg coolant temperatures and primary system pressure. Data for hot leg radial temperature gradients was used to determine an additional uncertainty value for the hot leg temperature measurement. Also included was the effect of noise and hum in the electronic equipment used in the resistance temperature sensor measurements in the hot and cold legs.

From the error analysis it was shown that the primary system flow measurement error is inversely proportional to core thermal power.

Since calorimetric data for 100% power operation was not available for St. Lucie Unit No. 1 (due to the imposed limitation in power), data obtained at Calvert Cliffs Unit No. 1 was used to determine a value for the primary system flow error at full power. Calvert Cliffs Unit No. 1 and St. Lucie Unit No. 1 have very similar plant-designs and the same thermal power rating, so the calorimetric data should also be approximately the same.

The results of the error analysis indicated that the error in measured primary system coolant flow rate in a plant such as Calvert Cliffs Unit No. 1 or St. Lucie Unit No. 1 is no more than $\pm 3.7\%$ of design flow rate with a confidence level of 2σ (95%). 3.7% is slightly conservative compared with the values commonly assumed for flow measurement uncertainty at other, similar plants.

Data taken at St. Lucie Unit No. 1 at 80% of full power on June 30, 1976, was used in a calorimetric flow determination resulting in a flow rate value of 399,800 gallons per minute (gpm). The current minimum value for primary system flow in the St. Lucie Unit No. 1 Technical Specifications is 370,000 gpm, while the LOCA analysis conservatively assumed a reduced flow of 354,000 gpm.

Correcting the flow rate value measured at St. Lucie Unit No. 1 for measurement uncertainty appropriate for 80% of full power (+4.6% of design flow), the resulting minimum flow is determined to be 384,850 gpm with a confidence level of 95%. This corrected value represents about a 4% margin over the Technical Specifications minimum value and about an 8.7% margin over the value assumed for the LOCA analysis.

Based on our review of the licensee's submittal regarding calorimetric primary flow determination, we conclude that the errors associated with such flow determination have been adequately accounted for and that the reported measured value of 399,800 gpm +4.6% of design flow is acceptable. We further conclude that the corrected flow measurement supports operation of St. Lucie Unit No. 1 at 100% of full rated power.

ENVIRONMENTAL CONSIDERATION

We have determined that the amendment does not authorize a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that the amendment involves an action which is insignificant from the standpoint of environmental impact and pursuant to 10 CFR §51.5(d)(4) that an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of this amendment.

CONCLUSION

We have concluded, based on the considerations discussed above, that: (1) because the amendment does not involve a significant increase in the probability or consequences of accidents previously considered and does not involve a significant decrease in a safety margin, the amendment does not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Date: February 18, 1977

UNITED STATES NUCLEAR REGULATORY COMMISSION

DOCKET NO. 50-335

FLORIDA POWER & LIGHT COMPANY

NOTICE OF ISSUANCE OF AMENDMENT TO FACILITY
OPERATING LICENSE

The U. S. Nuclear Regulatory Commission (the Commission) has issued Amendment No. 13 to Facility Operating License No. DPR-67, issued to Florida Power & Light Company (the licensee), which revised Technical Specifications for operation of the St. Lucie Plant Unit No. 1 (the facility) located in St. Lucie County, Florida. The amendment is effective as of its date of issuance.

The amendment (1) terminated the Commission's June 17, 1976 "Order for Modification of License" which had placed an interim power restriction on peak linear heat generation rate of 12.7 kW/ft and interim restrictions related to reactor coolant flow rate, (2) authorized 100% power operation, (3) revised the peak linear heat generation rate limit in Technical Specifications to 14.8 kW/ft, and (4) reinstated Technical Specification limits based on a reactor coolant flow rate of 370,000 gpm.

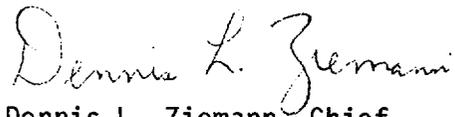
The applications for the amendment comply with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations. The Commission has made appropriate findings as required by the Act and the Commission's rules and regulations in 10 CFR Chapter I, which are set forth in the license amendment. Prior public notice of this amendment was not required since the amendment does not involve a significant hazards consideration.

The Commission has determined that the issuance of this amendment will not result in any significant environmental impact and that pursuant to 10 CFR §51.5(d)(4) an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with issuance of this amendment.

For further details with respect to this action, see (1) the applications for amendment dated July 9, 1976, and January 5, 1977, and supplemental information dated December 21, 1976, and February 1, 1977, (2) Amendment No.13 to License No. DPR-67, and (3) the Commission's related Safety Evaluation. All of these items are available for public inspection at the Commission's Public Document Room, 1717 H Street, N. W., Washington, D. C. and at the Indian River Junior College Library, 3209 Virginia Avenue, Ft. Pierce, Florida 33450. A single copy of items (2) and (3) may be obtained upon request addressed to the U. S. Nuclear Regulatory Commission, Washington, D. C. 20555, Attention: Director, Division of Operating Reactors.

Dated at Bethesda, Maryland, this 18th day of February, 1977.

FOR THE NUCLEAR REGULATORY COMMISSION



Dennis L. Ziemann, Chief
Operating Reactors Branch #2
Division of Operating Reactors