

July 27, 1994

Docket No. 50-400

Mr. W. R. Robinson  
Vice President - Harris Plant  
Carolina Power & Light Company  
Shearon Harris Nuclear Power Plant  
Post Office Box 165, Mail Code: Zone 1  
New Hill, North Carolina 27562-0165

Dear Mr. Robinson:

SUBJECT: ISSUANCE OF AMENDMENT NO. 50 TO FACILITY OPERATING LICENSE  
NO. NPF-63 REGARDING REACTOR COOLANT SYSTEM FLOW RATE - SHEARON  
HARRIS NUCLEAR POWER PLANT, UNIT 1 (TAC NO. M89450)

The Nuclear Regulatory Commission has issued the enclosed Amendment No. 50 to Facility Operating License No. NPF-63 for the Shearon Harris Nuclear Power Plant, Unit 1. This amendment changes the Technical Specifications (TS) in response to your request dated May 11, 1994.

The amendment to TS 3/4.2.3 allows reduced power operation as a function of reactor coolant system (RCS) for slightly lower total flow rate reductions of up to 5 percent below the current specified flow rate. Specifically, operation would be allowed at slightly lower total flow rates if rated thermal power is reduced by 1.5 percent for each 1 percent that RCS total flow is less than this rate. A copy of the related Safety Evaluation is enclosed.

A Notice of Issuance will be included in the Commission's regular bi-weekly Federal Register notice.

Sincerely,

Original Signed by:  
Ngoc B. Le, Project Manager  
Project Directorate II-1  
Division of Reactor Projects - I/II  
Office of Nuclear Reactor Regulation

Enclosures:

1. Amendment No. 50 to NPF-63
2. Safety Evaluation

cc w/enclosures:

See next page

\*See previous concurrence

OFFICE	LA:PD2-1	PM:PD2-1	PD:PD2-1	OGC*	
NAME	PAnderson	NLe:jrm	DMatthews	MZobler	
DATE	07/21/94	07/26/94	07/27/94	07/19/94	

Document Name: G:\HARRIS\HAR89450.AMD

9408080037 940727  
PDR ADDCK 05000400  
P PDR

NRC FILE CENTER COPY

DF01  
cl

Mr. W. R. Robinson  
Carolina Power & Light Company

Shearon Harris Nuclear Power Plant  
Unit 1

cc:

Mr. H. Ray Starling  
Manager - Legal Department  
Carolina Power & Light Company  
Post Office Box 1551  
Raleigh, North Carolina 27602

Admiral Kinnaird R. McKee  
214 South Morris Street  
Oxford, Maryland 21654

Resident Inspector/Harris NPS  
c/o U.S. Nuclear Regulatory Commission  
5421 Shearon Harris Road  
New Hill, North Carolina 27562-9998

Mr. Robert D. Martin  
3382 Sean Way  
Lawrenceville, Georgia 30244

Karen E. Long  
Assistant Attorney General  
State of North Carolina  
Post Office Box 629  
Raleigh, North Carolina 27602

Mr. J. W. Donahue  
Plant Manager - Harris Plant  
Carolina Power & Light Company  
Shearon Harris Nuclear Power Plant  
Post Office Box 165, MC: Zone 1  
New Hill, North Carolina 27562-0165

Public Service Commission  
State of South Carolina  
Post Office Drawer 11649  
Columbia, South Carolina 29211

Regional Administrator, Region II  
U.S. Nuclear Regulatory Commission  
101 Marietta St., N.W. Suite 2900  
Atlanta, Georgia 30323

Mr. Dayne H. Brown, Director  
Division of Radiation Protection  
N.C. Department of Environmental  
Commerce & Natural Resources  
Post Office Box 27687  
Raleigh, North Carolina 27611-7687

Mr. H. W. Habermeyer, Jr.  
Vice President  
Nuclear Services Department  
Carolina Power & Light Company  
Post Office Box 1551  
Raleigh, North Carolina 27602

Mr. W. R. Robinson  
Carolina Power & Light Company

Shearon Harris Nuclear Power Plant  
Unit 1

cc:

Mr. H. Ray Starling  
Manager - Legal Department  
Carolina Power & Light Company  
Post Office Box 1551  
Raleigh, North Carolina 27602

Admiral Kinnaird R. McKee  
214 South Morris Street  
Oxford, Maryland 21654

Resident Inspector/Harris NPS  
c/o U.S. Nuclear Regulatory Commission  
5421 Shearon Harris Road  
New Hill, North Carolina 27562-9998

Mr. Robert D. Martin  
3382 Sean Way  
Lawrenceville, Georgia 30244

Karen E. Long  
Assistant Attorney General  
State of North Carolina  
Post Office Box 629  
Raleigh, North Carolina 27602

Public Service Commission  
State of South Carolina  
Post Office Drawer 11649  
Columbia, South Carolina 29211

Regional Administrator, Region II  
U.S. Nuclear Regulatory Commission  
101 Marietta St., N.W. Suite 2900  
Atlanta, Georgia 30323

Mr. W. R. Robinson  
Vice President - Harris Plant  
Carolina Power & Light Company  
Shearon Harris Nuclear Power Plant  
Post Office Box 165, MC: Zone 1  
New Hill, North Carolina 27562-0165

Mr. Dayne H. Brown, Director  
Division of Radiation Protection  
N.C. Department of Environmental  
Commerce & Natural Resources  
Post Office Box 27687  
Raleigh, North Carolina 27611-7687

Mr. H. W. Habermeyer, Jr.  
Vice President  
Nuclear Services Department  
Carolina Power & Light Company  
Post Office Box 1551  
Raleigh, North Carolina 27602



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

July 27, 1994

Docket No. 50-400

Mr. W. R. Robinson  
Vice President - Harris Plant  
Carolina Power & Light Company  
Shearon Harris Nuclear Power Plant  
Post Office Box 165, Mail Code: Zone 1  
New Hill, North Carolina 27562-0165

Dear Mr. Robinson:

SUBJECT: ISSUANCE OF AMENDMENT NO. 50 TO FACILITY OPERATING LICENSE  
NO. NPF-63 REGARDING REACTOR COOLANT SYSTEM FLOW RATE - SHEARON  
HARRIS NUCLEAR POWER PLANT, UNIT 1 (TAC NO. M89450)

The Nuclear Regulatory Commission has issued the enclosed Amendment No. 50 to Facility Operating License No. NPF-63 for the Shearon Harris Nuclear Power Plant, Unit 1. This amendment changes the Technical Specifications (TS) in response to your request dated May 11, 1994.

The amendment to TS 3/4.2.3 allows reduced power operation as a function of reactor coolant system (RCS) for slightly lower total flow rate reductions of up to 5 percent below the current specified flow rate. Specifically, operation would be allowed at slightly lower total flow rates if rated thermal power is reduced by 1.5 percent for each 1 percent that RCS total flow is less than this rate. A copy of the related Safety Evaluation is enclosed.

A Notice of Issuance will be included in the Commission's regular bi-weekly Federal Register notice.

Sincerely,

A handwritten signature in black ink, appearing to read "Ngoc B. Le", is written below the word "Sincerely,".

Ngoc B. Le, Project Manager  
Project Directorate II-1  
Division of Reactor Projects - I/II  
Office of Nuclear Reactor Regulation

Enclosures:

1. Amendment No. 50 to NPF-63
2. Safety Evaluation

cc w/enclosures:  
See next page



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

CAROLINA POWER & LIGHT COMPANY, et al.

DOCKET NO. 50-400

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 50  
License No. NPF-63

1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by Carolina Power & Light Company, (the licensee), dated May 11, 1994, 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 Technical Specifications, as indicated in the attachment to this license amendment; and paragraph 2.C.(2) of Facility Operating License No. NPF-63 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, as revised through Amendment No. 50, are hereby incorporated into this license. Carolina Power & Light Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

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

FOR THE NUCLEAR REGULATORY COMMISSION



David B. Matthews, Director  
Project Directorate II-1  
Division of Reactor Projects - I/II  
Office of Nuclear Reactor Regulation

Attachment:  
Changes to the Technical  
Specifications

Date of Issuance: July 27, 1994

ATTACHMENT TO LICENSE AMENDMENT NO. 50

FACILITY OPERATING LICENSE NO. NPF-63

DOCKET NO. 50-400

Replace the following pages of the Appendix A Technical Specifications with the enclosed pages. The revised areas are indicated by marginal lines.

<u>Remove Page</u>	<u>Insert Page</u>
iii	iii
v	v
2-2	2-2
2-4	2-4
2-10	2-10
3/4 2-9	3/4 2-9
3/4 2-10	3/4 2-10
-	3/4 2-10a
-	3/4 2-10b
B 3/4 2-4	B 3/4 2-4
B 3/4 2-5	B 3/4 2-5
B 3/4 2-6	B 3/4 2-6

## INDEX

### 2.0 SAFETY LIMITS AND LIMITING SAFETY SYSTEM SETTINGS

<u>SECTION</u>	<u>PAGE</u>
<u>2.1 SAFETY LIMITS</u>	
2.1.1 REACTOR CORE.....	2-1
2.1.2 REACTOR COOLANT SYSTEM PRESSURE.....	2-1
FIGURE 2.1-1 REACTOR CORE SAFETY LIMITS - THREE LOOPS IN OPERATION WITH MEASURED RCS FLOW $\geq [293,540 \text{ GPM} \times (1.0 + C_1)]$	2-2
<u>2.2 LIMITING SAFETY SYSTEM SETTINGS</u>	
2.2.1 REACTOR TRIP SYSTEM INSTRUMENTATION SETPOINTS.....	2-1
TABLE 2.2-1 REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS...	2-4

### BASES

<u>SECTION</u>	<u>PAGE</u>
<u>2.1 SAFETY LIMITS</u>	
2.1.1 REACTOR CORE.....	B 2-1
2.1.2 REACTOR COOLANT SYSTEM PRESSURE.....	B 2-2
<u>2.2 LIMITING SAFETY SYSTEM SETTINGS</u>	
2.2.1 REACTOR TRIP SYSTEM INSTRUMENTATION SETPOINTS.....	B 2-2



## INDEX

### LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

<u>SECTION</u>	<u>PAGE</u>
<u>3/4.2 POWER DISTRIBUTION LIMITS</u>	
3/4.2.1 AXIAL FLUX DIFFERENCE.....	3/4 2-1
FIGURE 3.2-1 (DELETED).....	3/4 2-4
3/4.2.2 HEAT FLUX HOT CHANNEL FACTOR - $F_Q(Z)$ .....	3/4 2-5
FIGURE 3.2-2 (DELETED).....	3/4 2-8
3/4.2.3 RCS FLOW RATE AND NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR.....	3/4 2-9
FIGURE 3.2-3 ALLOWED MEASURED REACTOR COOLANT SYSTEM TOTAL FLOW RATE VERSUS POWER - THREE LOOPS IN OPERATION.....	3/4 2-10b
3/4.2.4 QUADRANT POWER TILT RATIO.....	3/4 2-11
3/4.2.5 DNB PARAMETERS.....	3/4 2-14
 <u>3/4.3 INSTRUMENTATION</u>	
3/4.3.1 REACTOR TRIP SYSTEM INSTRUMENTATION.....	3/4 3-1
TABLE 3.3-1 REACTOR TRIP SYSTEM INSTRUMENTATION.....	3/4 3-2
TABLE 3.3-2 (DELETED).....	3/4 3-9
TABLE 4.3-1 REACTOR TRIP SYSTEM INSTRUMENTATION SURVEILLANCE REQUIREMENTS.....	3/4 3-11
3/4.3.2 ENGINEERED SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION.....	3/4 3-16
TABLE 3.3-3 ENGINEERED SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION.....	3/4 3-18
TABLE 3.3-4 ENGINEERED SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS.....	3/4 3-28
TABLE 3.3-5 (DELETED).....	3/4 3-37
TABLE 4.3-2 ENGINEERED SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION SURVEILLANCE REQUIREMENTS.....	3/4 3-41
3/4.3.3 MONITORING INSTRUMENTATION Radiation Monitoring For Plant Operations.....	3/4 3-50

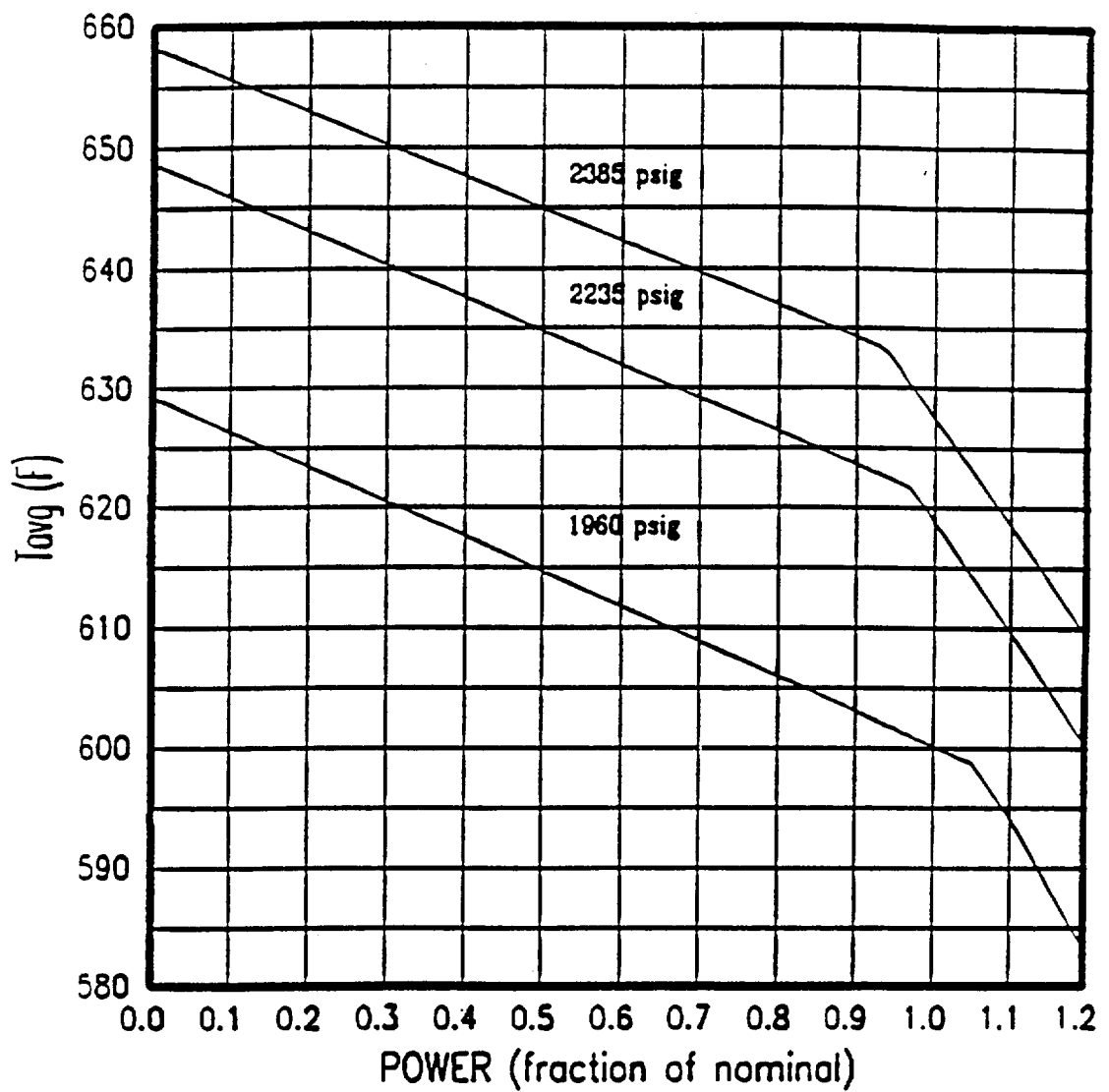


FIGURE 2.1-1  
 REACTOR CORE SAFETY LIMITS - THREE LOOPS IN OPERATION  
 WITH MEASURED RCS FLOW  $\geq [293,540 \text{ GPM} \times (1.0 + C_1)]$

TABLE 2.2-1

## REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	TOTAL ALLOWANCE (TA)	Z	SENSOR ERROR (S)	TRIP SETPOINT	ALLOWABLE VALUE
1. Manual Reactor Trip	N.A.	N.A.	N.A.	N.A.	N.A.
2. Power Range, Neutron Flux					
a. High Setpoint	7.5	4.56	0	$\leq 109\%$ of RTP** See Note 7	$\leq 111.1\%$ of RTP** See Note 7
b. Low Setpoint	8.3	4.56	0	$\leq 25\%$ of RTP**	$\leq 27.1\%$ of RTP**
3. Power Range, Neutron Flux, High Positive Rate	1.6	0.5	0	$\leq 5\%$ of RTP** with a time constant $\geq 2$ seconds	$\leq 6.3\%$ of RTP** with a time constant $\geq 2$ seconds
4. Power Range, Neutron Flux, High Negative Rate	1.6	0.5	0	$\leq 5\%$ of RTP** with a time constant $\geq 2$ seconds	$\leq 6.3\%$ of RTP** with a time constant $\geq 2$ seconds
5. Intermediate Range, Neutron Flux	17.0	8.41	0	$\leq 25\%$ of RTP**	$\leq 30.9\%$ of RTP**
6. Source Range, Neutron Flux	17.0	10.01	0	$\leq 10^5$ cps	$\leq 1.4 \times 10^5$ cps
7. Overtemperature $\Delta T$	8.7	6.02	Note 5	See Note 1	See Note 2
8. Overpower $\Delta T$	4.7	1.50	1.9	See Note 3	See Note 4
9. Pressurizer Pressure-Low	5.0	2.21	1.5	$\geq 1960$ psig	$\geq 1946$ psig
10. Pressurizer Pressure-High	7.5	5.01	0.5	$\leq 2385$ psig	$\leq 2399$ psig
11. Pressurizer Water Level- High	8.0	2.18	1.5	$\leq 92\%$ of instrument span	$\leq 93.8\%$ of instrument span

\*\*RTP = RATED THERMAL POWER

TABLE 2.2-1 (Continued)TABLE NOTATIONS

## NOTE 3: (Continued)

$K_6$	=	0.002/°F for $T > T''$ and $K_6 = 0$ for $T \leq T''$ ,
$T$	=	As defined in Note 1,
$T''$	=	Indicated $T_{avg}$ at RATED THERMAL POWER (Calibration temperature for $\Delta T$ instrumentation, $\leq 580.8^\circ\text{F}$ ),
$S$	=	As defined in Note 1, and
$f_2(\Delta I)$	=	0 for all $\Delta I$ .

NOTE 4: The channel's maximum Trip Setpoint shall not exceed its computed Trip Setpoint by more than 2.3%  $\Delta T$  span.

NOTE 5: The sensor error for temperature is 1.9 and 1.1 for pressure.

NOTE 6: The sensor error for steam flow is 0.9, for feed flow is 1.5, and for steam pressure is 0.75.

NOTE 7: This value is associated with measured RCS flow  $\geq [293,540 \text{ gpm} \times (1.0 + C_1)]$ . Technical Specification 3/4.2.3 requires this setpoint to be reduced at the rate of 1.5% of RTP for each 1% that measured RCS flow is below  $[293,540 \text{ gpm} \times (1.0 + C_1)]$ .

## POWER DISTRIBUTION LIMITS

### 3/4.2.3 RCS FLOW RATE AND NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR

#### LIMITING CONDITION FOR OPERATION

3.2.3 The combination of indicated Reactor Coolant System (RCS) total flow rate and THERMAL POWER shall be maintained within the region of permissible operation shown on Figure 3.2-3 for three loop operation and  $F_{\Delta H}$  shall be maintained as follows:

a.  $F_{\Delta H} \leq F_{\Delta H}^{RTP} [1.0 + PF_{\Delta H} (1.0 - P)]$

Where:

- $F_{\Delta H}^{RTP}$  =  $F_{\Delta H}$  Limit at RATED THERMAL POWER specified in the CORE OPERATING LIMITS REPORT (COLR), plant procedure PLP-106,
- $PF_{\Delta H}$  = Power Factor Multiplier for  $F_{\Delta H}$  specified in the COLR,
- $P$  =  $\frac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}$ ,
- $F_{\Delta H}$  = Enthalpy rise hot channel factor obtained by using the movable incore detectors to obtain a power distribution map, with the measured value of the nuclear enthalpy rise hot channel factor  $(F_{\Delta H}^N)$  increased by an allowance of 4% to account for measurement uncertainty.

APPLICABILITY: MODE 1.

#### ACTION:

- a. With the combination of RCS total flow rate and THERMAL POWER within the region of prohibited operation shown on Figure 3.2-3 or  $F_{\Delta H}$  outside the limits given in 3.2.3a.:
1. Within 2 hours either:
    - a) Restore the combination of RCS total flow rate and THERMAL POWER to within the region of permissible operation, and  $F_{\Delta H}$  to within the limits given in 3.2.3a., or
    - b) Restore the combination of RCS total flow rate and THERMAL POWER to within the region of restricted operation and comply with ACTION b. below, or

## POWER DISTRIBUTION LIMITS

### 3/4.2.3 RCS FLOW RATE AND NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR

#### LIMITING CONDITION FOR OPERATION

---

#### ACTION (Continued):

- c) Reduce THERMAL POWER to less than 50% of RATED THERMAL POWER and reduce the Power Range Neutron Flux - High Trip Setpoint to less than or equal to 55% of RATED THERMAL POWER within the next 4 hours.
- b. With the combination of RCS total flow rate and THERMAL POWER within the region of restricted operation (flow rate less than  $[293,540 \text{ gpm} \times (1.0 + C_1)]$ , which includes measurement uncertainty for core flow,  $C_1$ , as described in the Bases), within 6 hours reduce the Power Range Neutron Flux-High Trip Setpoint to below the nominal setpoint by the same amount (% RTP) as the power reduction required by Figure 3.2-3 and maintain  $F_{\Delta H}$  at a value that is less than or equal to the value of  $F_{\Delta H}$  at RATED THERMAL POWER.
- c. Within 24 hours of initially being within the region of prohibited operation shown on Figure 3.2-3 either:
  1. Verify through RCS total flow rate determination and incore flux mapping that the combination of RCS total flow rate and THERMAL POWER are restored to within the region of permissible operation, and  $F_{\Delta H}$  to within the limits given in 3.2.3a., or
  2. Verify through RCS total flow rate determination and incore flux mapping that the combination of RCS total flow rate and THERMAL POWER are restored to within the region of restricted operation and comply with ACTION b. above, or
  3. Reduce THERMAL POWER to less than 5% of RATED THERMAL POWER within the next 2 hours.
- d. Identify and correct the cause of the out-of-limit condition prior to increasing THERMAL POWER above the reduced THERMAL POWER limit required by ACTION a.1.c) and/or c.3), above; subsequent POWER OPERATION may proceed provided that the combination of THERMAL POWER and indicated RCS total flow rate are demonstrated through RCS total flow rate comparison to be within the regions of restricted or permissible operation shown on Figure 3.2-3 and that  $F_{\Delta H}$  is demonstrated through incore flux mapping to be within acceptable limits prior to exceeding the following THERMAL POWER levels:
  1. A nominal 50% of RATED THERMAL POWER,
  2. A nominal 75% of RATED THERMAL POWER, and
  3. Within 24 hours of attaining greater than or equal to 95% of RATED THERMAL POWER.

## POWER DISTRIBUTION LIMITS

### 3/4.2.3 RCS FLOW RATE AND NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR

#### SURVEILLANCE REQUIREMENTS

---

4.2.3.1 The provisions of Specification 4.0.4 are not applicable.

4.2.3.2  $F_{\Delta H}$  shall be determined to be within acceptable limits:

- a. Prior to operation above 75% of RATED THERMAL POWER after each fuel loading, and
- b. At least once per 31 Effective Full Power Days.

4.2.3.3 The RCS total flow rate shall be verified to be within the regions of restricted or permissible operation of Figure 3.2-3:

- a. At least once per 12 hours by the use of main control board instrumentation or equivalent, and
- b. At least once per 31 days by the use of process computer readings or digital voltmeter measurement.

4.2.3.4 The RCS total flow rate indicators shall be subjected to a CHANNEL CALIBRATION at least once per 18 months.

4.2.3.5 The RCS total flow rate shall be determined by precision heat balance measurement at least once per 18 months. The measurement instrumentation shall be calibrated within 21 days prior to the performance of the calorimetric flow measurement.

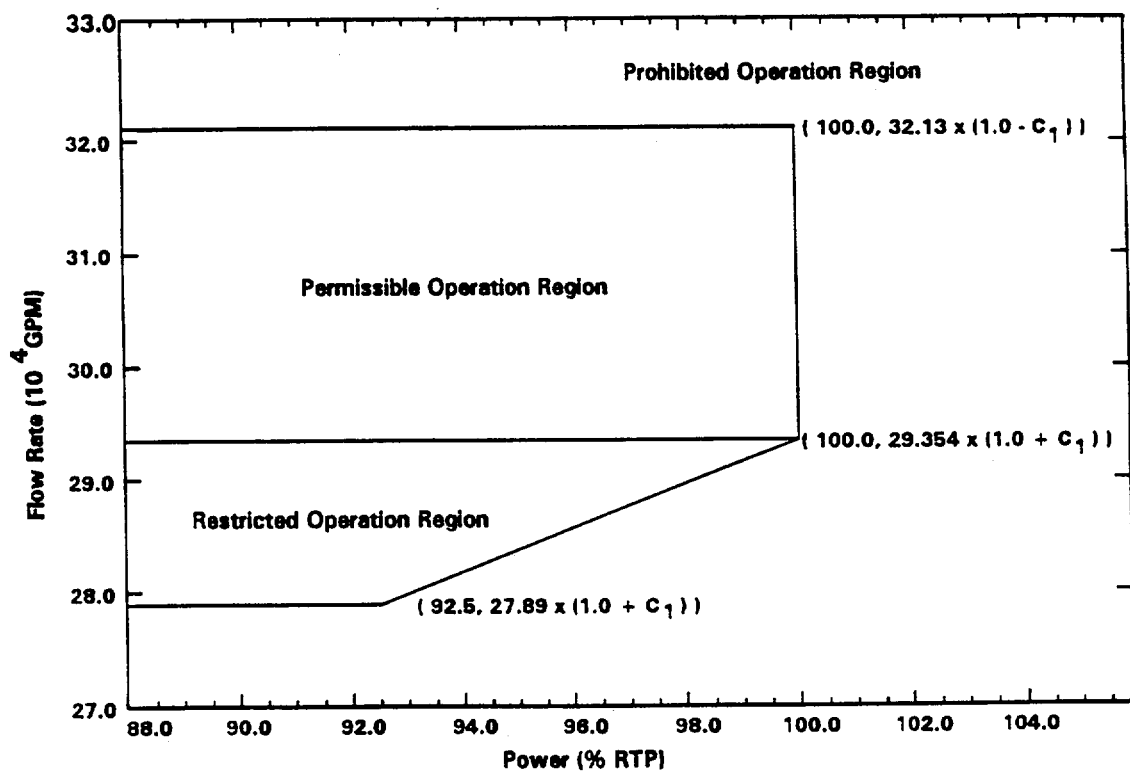


Figure 3.2-3

Allowed Measured Reactor Coolant System Total Flow Rate versus Power -  
Three Loops in Operation



## POWER DISTRIBUTION LIMITS

### BASES

#### HEAT FLUX HOT CHANNEL FACTOR, AND RCS FLOW RATE AND NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR (Continued)

- c. The control rod insertion limits of Specifications 3.1.3.5 and 3.1.3.6 are maintained; and
- d. The axial power distribution, expressed in terms of AXIAL FLUX DIFFERENCE, is maintained within the limits.

$F_{\Delta H}$  will be maintained within its limits provided Conditions a. through d. above are maintained. The combination of measured RCS flow rate and THERMAL POWER must be maintained within the regions of permissible or restricted operation as shown in Figure 3.2-3 to ensure that the combination of RCS flow rate and THERMAL POWER are within the ranges considered in the mechanical and safety analyses and, along with the measurement of  $F_{\Delta H}$ , to ensure that the calculated DNBR will not be below the design DNBR value. The relaxation of  $F_{\Delta H}$  as a function of THERMAL POWER when in the region of permissible operation allows changes in the radial power shape for all permissible rod insertion limits.

For the FSAR Chapter 15 analyses reliant on the Power Range Neutron Flux - High Trip Setting trip function, reduction of the Setpoint by the same percentage as the required power reduction in Figure 3.2-3 (1.5% RTP per 1% RCS flow rate) ensures DNBR margin is maintained. When in the region of restricted operation, defining  $\Delta T_0$  as the equivalent  $\Delta T$  at 100% RTP and  $[293,540 \text{ gpm} \times (1.0 + C_1)]$  (which includes measurement uncertainty for core flow) results in an effective OTAT setpoint reduction and maintains DNBR margins for those analyses reliant upon the OTAT trip. The additional restrictions on  $F_{\Delta H}$  when in the region of restricted operation ensure that the margins gained by the power and setpoint reductions are not reduced by the normally allowable increases in radial peaking at reduced power levels.

When an  $F_{\Delta H}$  measurement is taken, an allowance for measurement error must be applied prior to comparing to the  $F_{\Delta H}^{RTP}$  limit(s) specified in the CORE OPERATING LIMITS REPORT (COLR). An allowance of 4% is appropriate for a full-core map taken with the Incore Detector Flux Mapping System.

Margin is maintained between the safety analysis limit DNBR and the design limit DNBR. The margin is more than sufficient to offset any rod bow penalty and transition core penalty.

When an  $F_Q$  measurement is taken, an allowance for both experimental error and manufacturing tolerance must be made. An allowance of 5% is appropriate for a full-core map taken with the Incore Detector Flux Mapping System, and a 3% allowance is appropriate for manufacturing tolerance.

The hot channel factor  $F_Q^M(Z)$  is measured periodically and increased by a cycle and height dependent power factor  $V(Z)$  to provide assurance that the

## POWER DISTRIBUTION LIMITS

### BASES

#### HEAT FLUX HOT CHANNEL FACTOR, AND RCS FLOW RATE AND NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR (Continued)

limit on the hot channel factor,  $F_Q(Z)$ , is met.  $V(Z)$  accounts for the effects of normal operation transients and was determined from expected power control maneuvers over the full range of burnup conditions in the core. The  $V(Z)$  function is specified in the COLR.

When RCS flow rate is measured, no additional allowance is necessary prior to comparison with the limit of Specification 3.2.3. A normal RCS flowrate error of 2.1% will be included in  $C_1$ , which will be modified as discussed below.

The measurement error for RCS total flow rate is based upon performing a precision heat balance and using the result to calibrate the RCS flow rate indicators. Potential fouling of the feedwater venturi which might not be detected could bias the result from the precision heat balance in a non-conservative manner. Therefore, a penalty of 0.1% for undetected fouling of the feedwater venturi, raises the nominal flow measurement allowance,  $C_1$ , to 2.2% for no venturi fouling. Any fouling which might bias the RCS flow rate measurement greater than 0.1% can be detected by monitoring and trending various plant performance parameters. If detected, action shall be taken before performing subsequent precision heat balance measurements, i.e., either the effect of the fouling shall be quantified and compensated for in the RCS flow rate measurement or the venturi shall be cleaned to eliminate the fouling.

The upper limit on measured RCS flow rate in Figure 3.2-3 [ $321,300 \text{ gpm} \times (1.0 - C_1)$ ] protects the mechanical design flow of 321,300 gpm per FSAR Table 5.1.0-1.

The 12-hour periodic surveillance of indicated RCS flow is sufficient to detect only flow degradation that could lead to operation outside the acceptable region of operation.

#### 3/4.2.4 QUADRANT POWER TILT RATIO

The QUADRANT POWER TILT RATIO limit assures that the radial power distribution satisfies the design values used in the power capability analysis. Radial power distribution measurements are made during STARTUP testing and periodically during power operation.

The limit of 1.02, at which corrective action is required, provides DNB and linear heat generation rate protection with x-y plane power tilts. A limiting tilt of 1.025 can be tolerated before the margin for uncertainty in  $F_Q$  is depleted. A limit of 1.02 was selected to provide an allowance for the uncertainty associated with the indicated power tilt.

The 2-hour time allowance for operation with a tilt condition greater than 1.02 but less than 1.09 is provided to allow identification and correction of

## POWER DISTRIBUTION LIMITS

### BASES

---

#### QUADRANT POWER TILT RATIO (Continued)

a dropped or misaligned control rod. In the event such action does not correct the tilt, the margin for uncertainty on  $F_Q$  is reinstated by reducing the maximum allowed power by 3% for each percent of tilt in excess of 1.

For purposes of monitoring QUADRANT POWER TILT RATIO when one excore detector is inoperable, the movable incore detectors are used to confirm that the normalized symmetric power distribution is consistent with the QUADRANT POWER TILT RATIO. The incore detector monitoring is done with a full incore flux map or two sets of four symmetric thimbles. The preferred sets of four symmetric thimbles is a unique set of eight detector locations. These locations are C-8, E-5, E-11, H-3, H-13, L-5, L-11, N-8. If other locations must be used, a special report to NRC should be submitted within 30 days in accordance with 10CFR50.4.

#### 3/4.2.5 DNB PARAMETERS

The limits on the DNB-related parameters assure that each of the parameters are maintained within the normal steady-state envelope of operation assumed in the transient and accident analyses. The limits are consistent with the initial FSAR assumptions and have been analytically demonstrated adequate to maintain a minimum DNBR that is equal to or greater than the design DNBR value throughout each analyzed transient. The indicated  $T_{avg}$  value and the indicated pressurizer pressure value are compared to analytical limits of 586.1°F and 2185 psig, respectively, after an allowance for measurement uncertainty is included.

The 12-hour periodic surveillance of these parameters through instrument read-out is sufficient to ensure that the parameters are restored within their limits following load changes and other expected transient operation.



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NO. 50 TO FACILITY OPERATING LICENSE NO. NPF-63

CAROLINA POWER & LIGHT COMPANY

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1

DOCKET NO. 50-400

1.0 INTRODUCTION

By letter dated May 11, 1994, Carolina Power & Light Company (the licensee) submitted a request for changes to the Shearon Harris Nuclear Power Plant, Unit 1, Technical Specifications (TS). The proposed amendment would establish limits on reactor power level as a function of total reactor coolant system (RCS) flow rate up to 5 percent below the current flow rate. Specifically, the licensee proposes that the rated power be reduced by 1.5 percent for each 1.0 percent that the RCS flow is less than the required minimum flow at rated thermal power. The 1.5 percent power to 1.0 percent flow ratio was provided to the licensee in an April 22, 1994, letter by the Siemens Power Corporation, the Shearon Harris fuel vendor. The staff's evaluation of the licensee's proposed changes follows.

2.0 EVALUATION

The reason for the request is the severe power reduction specified by the current TS 3/4.2.3, RCS Flow Rate and Nuclear Enthalpy Rise Hot Channel Factor, which requires an initial power reduction to less than 50 percent and, subsequently, to less than 5 percent if measured flow is less than the specified limit. The measured RCS total flow must be equal to or greater than  $293,540 \text{ gpm} \times (1.0 + C_1)$  where  $C_1$  is a nominal flow measurement allowance. The current value of  $C_1$  is 0.022, thus, the margin from the last measured value of 304,554 gpm is 1.52 percent. During the recent refueling outage, the licensee implemented several significant changes that can affect measured RCS flow; the changes included elimination of the resistance temperature detectors, transition to a new nuclear fuel, and reduction in RCS average temperature  $T_{\text{avg}}$ . None of these changes would significantly alter the actual RCS flow, but because of the small margin between flow and the TS limit there is the potential for a lower calculated flow that does not satisfy the value estimated by the above formula. Therefore, the proposed TS change is to preclude major power reduction due to minor changes to the measured flow.

Power operation with reduced flow requires a corresponding reduction in power and lowering of the power range neutron flux high trip setpoint. Analyses performed by the Siemens Power Corporation indicates that the 1.5 percent power to 1.0 percent flow ratio along with the same reduction of the power

range neutron flux high trip setpoint, ensures that the minimum departure from nucleate boiling ratio (MDNBR) margin is maintained for those events which utilize the power range neutron flux high trip setpoint function. This power/flow reduction also maintains the enthalpy rise hot channel factor ( $F_{AH}$ ) at a value which is less than or equal to the value at 100 percent rated thermal power including measurement uncertainty.

For transients that depend on over-temperature delta temperature (OT $\Delta$ T), the staff has determined that the proposed power/flow reduction is acceptable. In the OT $\Delta$ T equation,  $\Delta T$  is measured and  $\Delta T_0$  is the indicated  $\Delta T$  at the rated thermal power and minimum required flow, thus,  $\Delta T/\Delta T_0$  is equivalent to a power fraction with respect to rated power. Therefore,  $\Delta T$  is a direct measure of reactor power, and when the minimum required flow is reduced by a small fraction, the  $\Delta T_0$  will increase and, correspondingly, the estimated rated thermal power will increase by the same small fraction (while in reality power has not changed). If power was then reduced by a correspondingly small amount, the  $\Delta T/\Delta T_0$  would remain unchanged. Therefore, by reducing the rated power and correspondingly reducing flow, the same OT $\Delta$ T setpoint will maintain the MDNBR margin for those transients that rely on the OT $\Delta$ T trip.

In summary, the staff finds that the proposed TS changes that specify reduction of 1.5 percent of rated thermal power for every 1.0 percent of estimated flow below the minimum required flow for the rated thermal power will maintain the MDNBR and  $F_{AH}$  margins for events which rely on power range neutron flux high power trip or an OT $\Delta$ T trip. Therefore, the proposed changes are acceptable.

### 3.0 STATE CONSULTATION

In accordance with the Commission's regulations, the State of North Carolina official was notified of the proposed issuance of the amendment. The State official had no comments.

### 4.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes the Surveillance Requirements. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (59 FR 27079). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

## 5.0 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 amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: L. Lois

Date: July 27, 1994

AMENDMENT NO. 50 TO FACILITY OPERATING LICENSE NO. NPF-63 - HARRIS, UNIT 1

DISTRIBUTION:

Docket File  
NRC/Local PDRs  
PD II-1 Reading File  
S. Varga  
D. Matthews  
P. Anderson  
N. Le  
OGC  
D. Hagan  
G. Hill (2)  
L. Lois  
T. Collins  
ACRS (10)  
OPA  
OC/LFDCB  
J. Johnson, Acting, R-II

cc: Harris Service List