December 29, 1994

Mr. John F. Opeka
Executive Vice President, Nuclear
Connecticut Yankee Atomic Power Company
Northeast Nuclear Energy Company
Post Office Box 270
Hartford, CT 06141-0270

SUBJECT: ISSUANCE OF AMENDMENT (TAC NO. M90035)

Dear Mr. Opeka:

The Commission has issued the enclosed Amendment No. 99 to Facility Operating License No. NPF-49 for the Millstone Nuclear Power Station, Unit No. 3, in response to your application dated July 22, 1994.

The amendment (1) changes the title of Figure 3.1-5 to be consistent with the applicable Limiting Condition For Operation (LCO), (2) relocates the Chemical and Volume Control System (CVCS) valve position requirements to the Reactivity Control Systems - Shutdown Margin specifications, and (3) consolidates action statements to be expressed in the LCOs rather than in Surveillance Requirements. The amendment also clarifies the requirements for calculating the heat flux hot channel factor $F_Q(z)$ when using the base load option.

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

Sincerely, Original signed by Ronald Hernan

for: Vernon L. Rooney, Senior Project Manager
Project Directorate I-4
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket No. 50-423
Enclosures: 1. Amendment No. 99 to NPF-49
2. Safety Evaluation
cc w/encls: See next page

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DOCUMENT NAME: G:\GRIGGS\M90035.AMD

OFFICE	LA:PDI-4	PM:PDI-4	PM:PDI-4	D:PDI-4	BC:SRXB	OGC
NAME	SNorris	MGriggs	VRooney:bf	PMcKee	RJones	S Hom
DATE	12/14/94	12/13/94	12/19/94	12/14/94	12/16/94	12/21/94

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Marsette Griggs for

for: Vernon L. Rooney, Senior Project Manager
Project Directorate I-4
Division of Reactor Projects - I/II
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

December 29, 1994

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Executive Vice President, Nuclear
Connecticut Yankee Atomic Power Company
Northeast Nuclear Energy Company
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Ronald W. Eernan for

Vernon L. Rooney, Senior Project Manager
Project Directorate I-4
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket No. 50-423

Enclosures: 1. Amendment No. 99 to NPF-49
2. Safety Evaluation

cc w/encls: See next page

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

NORTHEAST NUCLEAR ENERGY COMPANY, ET AL.

DOCKET NO. 50-423

MILLSTONE NUCLEAR POWER STATION, UNIT NO. 3

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 99
License No. NPF-49

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

   A. The application for amendment by Northeast Nuclear Energy Company, et al. (the licensee), dated July 22, 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-49 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 99 , and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto are hereby incorporated in the license. The licensee 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, to be implemented within 30 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Ronald W. Hernan for

Phillip F. McKee, Director
Project Directorate I-4
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: December 29, 1994

ATTACHMENT TO LICENSE AMENDMENT NO. 99

FACILITY OPERATING LICENSE NO. NPF-49

DOCKET NO. 50-423

Replace the following pages of the Appendix A Technical Specifications with the enclosed pages. The revised pages are identified by amendment number and contain vertical lines indicating the areas of change.

Remove	Insert
iv	iv
3/4 1-8	3/4 1-8
--	3/4 1-8a
3/4 1-9	3/4 1-9
3/4 2-5	3/4 2-5
3/4 2-6	3/4 2-6
3/4 2-7	3/4 2-7
3/4 2-8	3/4 2-8
3/4 2-9	3/4 2-9
3/4 2-10	3/4 2-10
3/4 2-11	3/4 2-11
3/4 2-12	3/4 2-12
3/4 2-13	3/4 2-13
3/4 2-14	3/4 2-14
3/4 2-15	3/4 2-15
3/4 2-16	3/4 2-16
3/4 2-17	3/4 2-17
3/4 2-18	3/4 2-18
3/4 4-6	3/4 4-6
3/4 4-6a	--
3/4 9-1	3/4 9-1
B 3/4 1-1	B 3/4 1-1
B 3/4 4-1	B 3/4 4-1

LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

SHUTDOWN MARGIN - COLD SHUTDOWN - LOOPS NOT FILLED

LIMITING CONDITION FOR OPERATION

3.1.1.2 The SHUTDOWN MARGIN shall be greater than or equal to

a) the limits shown in Figure 3.1-5 or

b) the limits shown in Figure 3.1-4, with the chemical and volume control system (CVCS) aligned to preclude reactor coolant system boron concentration reduction.

APPLICABILITY: MODE 5 LOOPS NOT FILLED

ACTION:

a. With the SHUTDOWN MARGIN less than the above, immediately initiate and continue boration at greater than or equal to 33 gpm of a soluti containing greater than or equal to 6300 ppm boron or equivalent the required SHUTDOWN MARGIN is restored.

b. With the CVCS dilution flow paths not closed and secured in position in accordance with Specification 3.1.1.2(b), immediately close and secure the paths or meet the limits shown in Figure 3.1-5.

SURVEILLANCE REQUIREMENTS

4.1.1.2.1 The SHUTDOWN MARGIN shall be determined to be greater than or equal to the above:

a. Within 1 hour after detection of an inoperable control rod(s) and at least once per 12 hours thereafter while the rod(s) is inoperable. If the inoperable control rod is immovable or untrippable, the SHUTDOWN MARGIN shall be verified acceptable with an increased allowance for the withdrawn worth of the immovable or untrippable control rod(s); and

b. At least once per 24 hours by consideration of the following factors:

1) Reactor Coolant System boron concentration,

2) Control rod position,

3) Reactor Coolant System average temperature,

4) Fuel burnup based on gross thermal energy generation,

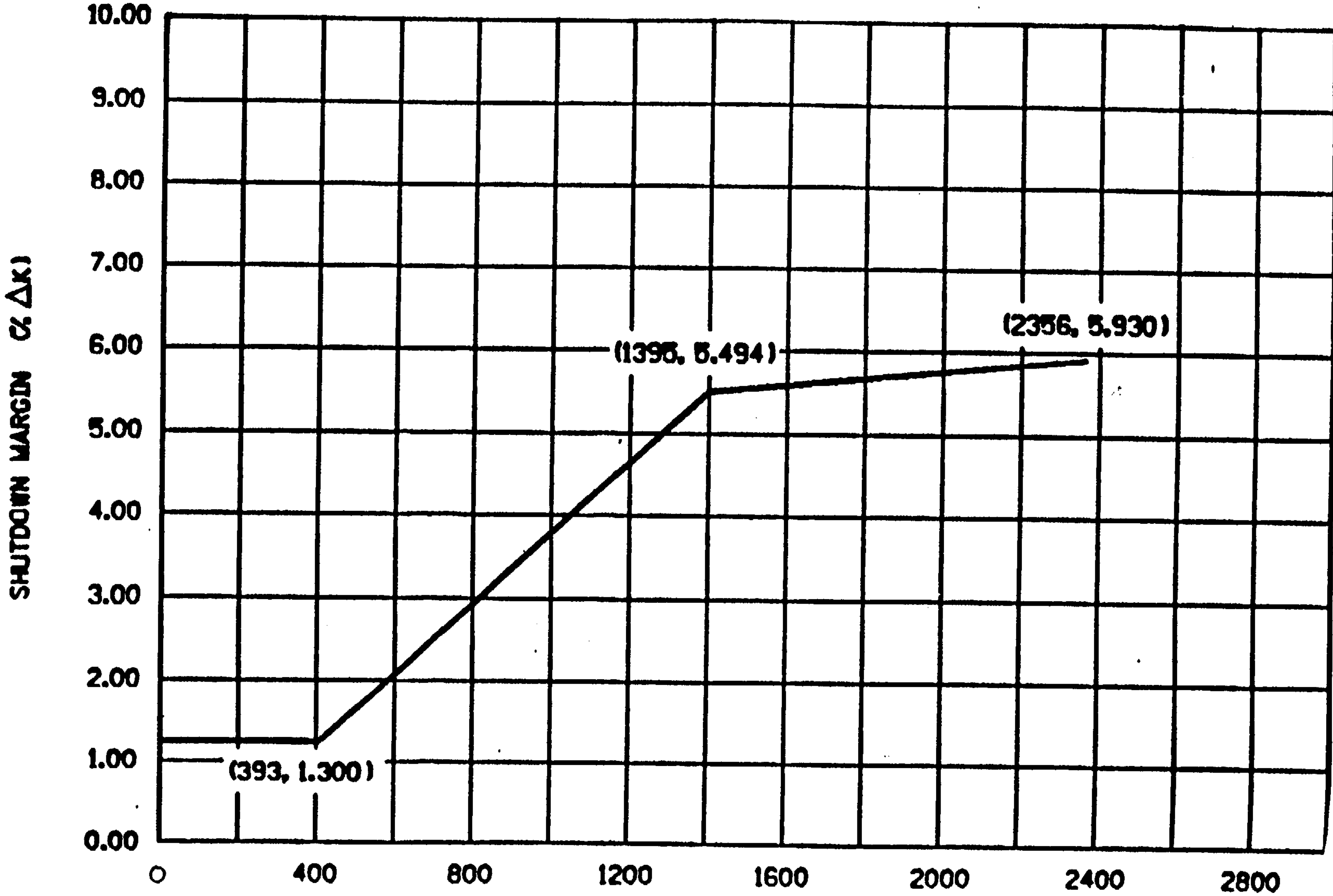
5) Xenon concentration, and

6) Samarium concentration.

4.1.1.2.2 At least once per 31 days the following valves shall be verified closed and locked. The valves may be opened on an intermittent basis under administrative controls except as noted.

Valve Number	Valve Function	Valve Position
1. V304(Z-)	Primary Grade Water to CVCS	Closed
2. V120(Z-)	Moderating Hx Outlet	Closed
3. V147(Z-)	BTRS Outlet	Closed
4. V797(Z-)	Failed Fuel Monitoring Flushing	Closed
5. V100(Z-)	Resin Sluice, CVCS Cation Bed Demineralizer	Closed
6. V571(Z-)	Resin Sluice, CVCS Cation Bed Demineralizer	Closed
7. V111(Z-)	Resin Sluice, CVCS Cation Bed Demineralizer	Closed
8. V112(Z-)	Resin Sluice, CVCS Cation Bed Demineralizer	Closed
9. V98(Z-)/V99(Z-)	Resin Sluice, CVCS Mixed Bed Demineralizer	Closed
10. V569(Z-)/V570(Z-)	Resin Sluice, CVCS Mixed Bed Demineralizer	Closed
11. V107(Z-)/V109(Z-)	Resin Sluice, CVCS Mixed Bed Demineralizer	Closed
12. V108(Z-)/V110(Z-)	Resin Sluice, CVCS Mixed Bed Demineralizer	Closed
13. V305(Z-)*	Primary Grade Water to Charging Pumps	Closed

*This valve may not be opened under administrative controls.



RCS CRITICAL BORON CONCENTRATION (ppm)

FIGURE 3.1-5

REQUIRED SHUTDOWN MARGIN FOR MODE 5 WITH RCS LOOPS NOT FILLED

3/4.2.2 HEAT FLUX HOT CHANNEL FACTOR - $F_Q(Z)$

FOUR LOOPS OPERATING

LIMITING CONDITION FOR OPERATION

3.2.2.1 $F_Q(Z)$ shall be limited by the following relationships:

$$F_Q(Z) \le \frac{F_Q^{RTP}}{P} K(Z) \text{ for } P > 0.5$$

$$F_Q(Z) \le \frac{F_Q^{RTP}}{0.5} K(Z) \text{ for } P \le 0.5$$

F_Q^{RTP} = the F_Q limit at RATED THERMAL POWER (RTP) provided in the core operating limits report (COLR).

$$\text{Where: } P = \frac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}, \text{ and}$$

K(Z) = the normalized $F_Q(Z)$ as a function of core height specified in the COLR.

APPLICABILITY: MODE 1.

ACTION:

With $F_Q(Z)$ exceeding its limit:

a. For RAOC operation with $F_Q(Z)$ outside the applicable limit specified in the COLR, perform one of the following actions:

(1) Within 15 minutes, control the AFD to within new AFD limits which are determined by reducing the applicable AFD limits by 1% AFD for each percent $F_Q(Z)$ exceeds its limits. Within 8 hours, reset the AFD alarm setpoints to these modified limits.

(2) Reduce THERMAL POWER at least 1% for each 1% $F_Q(Z)$ exceeds the limit within 15 minutes and similarly reduce the Power Range Neutron Flux-High Trip Setpoints within the next 4 hours; POWER OPERATION may proceed for up to a total of 72 hours; subsequent POWER OPERATION may proceed provided the Overpower ΔT Trip Setpoints have been reduced at least 1% for each 1% $F_Q(Z)$ exceeds the limit.

(3) Verify that the requirements of Specification 4.2.2.1.3 for base load operation are satisfied and enter base load operation.

Where it is necessary to calculate the percent that $F_Q(Z)$ exceeds the limits for items (1) and (2) above, it shall be calculated as the maximum percent over the core height (Z) that $F_Q(Z)$ exceeds its limit by the following expression:

$$\left[\left[\frac{F_Q^M(Z)\ x\ W(Z)}{\frac{F_Q^{RTP}}{P}\ x\ K(Z)}\right]-1\right] x\ 100\ for\ P \geq 0.5$$

$$\left[\left[\frac{F_Q^M(Z)\ x\ W(Z)}{\frac{F_Q^{RTP}}{0.5}\ x\ K(Z)}\right]-1\right] x\ 100\ for\ P < 0.5$$

b. For base load operation outside the applicable limit specified in the COLR, perform either of the following actions:

(1) Place the core in an equilibrium condition where the limit in 4.2.2.1.2.C is satisfied, and remeasure $F_Q^M(Z)$, or

LIMITING CONDITION FOR OPERATION (Continued)

(2) Reduce THERMAL POWER at least 1% for each 1% $F_Q(Z)$ exceeds the limit within 15 minutes and similarly reduce the Power Range Neutron Flux-High Trip Setpoints within the next 4 hours; POWER OPERATION may proceed for up to a total of 72 hours; subsequent POWER OPERATION may proceed provided the Overpower ΔT Trip setpoints have been reduced at least 1% for each 1% $F_Q(Z)$exceeds the limit. The percent that F_Q exceeds its limit shall be calculated as the maximum percent over the core height (Z) by the following expression:

$$\left[\left[\frac{F_Q^M(Z)\ x\ W(Z)_{BL}}{\frac{F_Q^{RTP}}{P}\ x\ K(Z)}\right]-1\right] x\ 100\ for\ P \geq APL^{ND}$$

c. Identify and correct the cause of the out-of-limit condition prior to increasing THERMAL POWER above the reduced limit required by ACTION a or b, above; THERMAL POWER may then be increased provided $F_Q(Z)$ is demonstrated through incore mapping to be within this limit.

SURVEILLANCE REQUIREMENTS

4.2.2.1.1 The provisions of Specification 4.0.4 are not applicable.

4.2.2.1.2 For RAOC operation, $F_Q(Z)$ shall be evaluated to determine if $F_Q(Z)$ is within its limit by:

a. Using the movable incore detectors to obtain a power distribution map at any THERMAL POWER greater than 5% of RATED THERMAL POWER.

b. Increasing the measured $F_Q(Z)$ component of the power distribution map by 3% to account for manufacturing tolerances and further increasing the value by 5% to account for measurement uncertainties. Verify the requirements of Specification 3.2.2.1 are satisfied.

c. Satisfying the following relationship:

$$F_Q^M(Z) \leq \frac{F_Q^{RTP} \times K(Z)}{P \times W(Z)} \text{ for } P > 0.5$$

$$F_Q^M(Z) \leq \frac{F_Q^{RTP} \times K(Z)}{W(Z) \times 0.5} \text{ for } P \leq 0.5$$

where $F_Q^M(Z)$ is the measured $F_Q(Z)$ increased by the allowances for manufacturing tolerances and measurement uncertainty, F_Q^{RTP} is the limit, K(Z) is the normalized $F_Q(Z)$ as a function of core height, P is the relative THERMAL POWER, and W(Z) is the cycle-dependent function that accounts for power distribution transients encountered during normal operation. F_Q^{RTP}, K(Z), and W(Z) are specified in the CORE OPERATING LIMITS REPORT as per Specification 6.9.1.6.

d. Measuring $F_Q^M(Z)$ according to the following schedule:

(1) Upon achieving equilibrium conditions after exceeding by 10% or more of RATED THERMAL POWER, the THERMAL POWER at which $F_Q(Z)$ was last determined,* or

(2) At least once per 31 Effective Full Power Days, whichever occurs first.

e. With the maximum value of

$$\frac{F_Q^M(Z)}{K(Z)}$$

over the core height (Z) increasing since the previous determination of $F_Q^M(Z)$, either of the following actions shall be taken:

(1) $F_Q^M(Z)$ shall be increased by 2% over that specified in Specification 4.2.2.1.2c, or

* During power escalation at the beginning of each cycle, power level may be increased until a power level for extended operation has been achieved and power distribution map outlined.

(2) $F_Q^M(Z)$ shall be measured at least once per 7 Effective Full Power Days until two successive maps indicate that the maximum value of

$$\frac{F_Q^M(Z)}{K(Z)}$$

over the core height (Z) is not increasing.

f. The limits specified in Specifications 4.2.2.1.2c and 4.2.2.1.2e above are not applicable in the following core plane regions:

(1) Lower core region from 0% to 15%, inclusive.
(2) Upper core region from 85% to 100%, inclusive.

4.2.2.1.3 Base load operation is permitted at powers above APL^{ND} if the following conditions are satisfied:

a. Prior to entering base load operation, maintain THERMAL POWER above APL^{ND} and less than or equal to that allowed by Specification 4.2.2.1.2 for at least the previous 24 hours. Maintain base load operation surveillance (AFD within the target band limit about the target flux difference of Specification 3.2.1.1) during this time period. Base load operation is then permitted providing THERMAL POWER is maintained between APL^{ND} and APL^{BL} or between APL^{ND} and 100% (whichever is most limiting) and F_Q surveillance is maintained pursuant to Specification 4.2.2.1.4. APL^{BL} is defined as the minimum value of:

$$APL^{BL} = \frac{F_Q^{RTP} \times K(Z)}{F_Q^M(Z) \times W(Z)_{BL}} \times 100\%$$

over the core height (Z) where: $F_Q^M(Z)$ is the measured $F_Q(Z)$ increased by the allowances for manufacturing tolerances and measurement uncertainty. The F_Q limit is F_Q^{RTP}. $W(Z)_{BL}$ is the cycle-dependent function that accounts for limited power distribution transient encountered during base load operation. F_Q^{RTP}, K(Z), and $W(Z)_{BL}$ are specified in the COLR as per Specification 6.9.1.6.

SURVEILLANCE REQUIREMENTS (Continued)

b. During base load operation, if the THERMAL POWER is decreased below APL^{ND} then the conditions of 4.2.2.1.3.a shall be satisfied before reentering base load operation.

4.2.2.1.4 During base load operation $F_Q(Z)$ shall be evaluated to determine if $F_Q(Z)$ is within its limit by:

a. Using the movable incore detectors to obtain a power distribution map at any THERMAL POWER above APL^{ND}.

b. Increasing the measured $F_Q(Z)$ component of the power distribution map by 3% to account for manufacturing tolerances and further increasing the value by 5% to account for measurement uncertainties. Verify the requirements of Specification 3.2.2.1 are satisfied.

c. Satisfying the following relationship:

$$F_Q^M(Z) \leq \frac{F_Q^{RTP} \times K(Z)}{P \times W(Z)_{BL}} \text{ for } P > APL^{ND}$$

where: $F_Q^M(Z)$ is the measured $F_Q(Z)$. F_Q^{RTP} is the F_Q limit, the normalized $F_Q(Z)$ as a function of core height. P is the relative THERMAL POWER. $W(Z)_{BL}$ is the cycle-dependent function that accounts for limited power distribution transients encountered during base load operation. F_Q^{RTP}, K(Z), and $W(Z)_{BL}$ are specified in the COLR as per Specification 6.9.1.6.

d. Measuring $F_Q^M(Z)$ in conjunction with target flux difference determination according to the following schedule:

(1) Prior to entering base load operation after satisfying Section 4.2.2.1.3 unless a full core flux map has been taken in the previous 31 EFPD with the relative thermal power having been maintained above APL^{ND} for the 24 hours prior to mapping, and

(2) At least once per 31 Effective Full Power Days.

e. With the maximum value of

$$\frac{F_Q^M(Z)}{K(Z)}$$

over the core height (Z) increasing since the previous determination of $F_Q^M(Z)$, either of the following actions shall be taken:

(1) $F_Q^M(Z)$ shall be increased by 2% over that specified in 4.2.2.1.4.c, or

(2) $F_Q^M(Z)$ shall be measured at least once per 7 Effective Full Power Days until 2 successive maps indicate that the maximum value of

$$\frac{F_Q^M(Z)}{K(Z)}$$

over the core height (Z) is not increasing.

f. The limits specified in 4.2.2.1.4.c and 4.2.2.1.4.e are not applicable in the following core plane regions:

(1) Lower core region 0% to 15%, inclusive.
(2) Upper core region 85% to 100%, inclusive.

4.2.2.1.5 When $F_Q(Z)$ is measured for reasons other than meeting the requirements of Specifications 4.2.2.1.2 or 4.2.2.1.4, an overall measured $F_Q(Z)$ shall be obtained from a power distribution map and increased by 3% to account for manufacturing tolerances and further increased by 5% to account for measurement uncertainty.

HEAT FLUX HOT CHANNEL FACTOR - $F_Q(Z)$

THREE LOOPS OPERATING

LIMITING CONDITION FOR OPERATION

3.2.2.2 $F_Q(Z)$ shall be limited by the following relationships:

$$F_Q(Z) \le \frac{F_Q^{RTP}}{P}\,[K(Z)] \text{ for } P > 0.375$$

$$F_Q(Z) \le \left[\frac{F_Q^{RTP}}{0.375}\right][K(Z)] \text{ for } P \le 0.375$$

F_Q^{RTP} = The F_Q limit at RATED THERMAL POWER (RTP) specified in the CORE OPERATING LIMITS REPORT (COLR).

Where: $P = \frac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}$, and

K(Z) = the normalized $F_Q(Z)$ as a function of core height specified in the COLR.

APPLICABILITY: MODE 1.

ACTION:

With $F_Q(Z)$ exceeding its limit:

a. For RAOC operation with $F_Q(Z)$ outside the applicable limit specified in the COLR, perform one of the following actions:

(1) Within 15 minutes, control the AFD to within new AFD limits which are determined by reducing the applicable AFD limits by 1% AFD for each percent $F_Q(Z)$ exceeds its limits. Within 8 hours, reset the AFD alarm setpoints to these modified limits.

(2) Reduce THERMAL POWER at least 1% for each 1% $F_Q(Z)$ exceeds the limit within 15 minutes and similarly reduce the Power Range Neutron Flux-High Trip Setpoints within the next 4 hours; POWER OPERATION may proceed for up to a total of 72 hours; subsequent

POWER OPERATION may proceed provided the Overpower ΔT Trip Setpoints have been reduced at least 1% for each 1% $F_Q(Z)$ exceeds the limit. The Overpower ΔT Trip Setpoint reduction shall be performed with the reactor in at least HOT STANDBY.

(3) Verify that the requirements of Specification 4.2.2.1.3 for base load operation are satisfied and enter base load operation.

Where it is necessary to calculate the percent that $F_Q(Z)$ exceeds the limits for items (1) and (2) above, it shall be calculated as the maximum percent over the core height (Z) that $F_Q(Z)$ exceeds its limit by the following expression:

$$\left[\left[\frac{F_Q^M(Z)\ x\ W(Z)}{\frac{F_Q^{RTP}}{P}\ x\ K\ (Z)}\right]-1\right] x\ 100\ \text{for}\ P \geq 0.375$$

$$\left[\left[\frac{F_Q^M(Z)\ x\ W(Z)}{\frac{F_Q^{RTP}}{0.375}\ x\ K(Z)}\right]-1\right] x\ 100\ \text{for}\ P < 0.375$$

b. For base load operation outside the applicable limit specified in the COLR, perform either of the following actions:

(1) Place the core in an equilibrium condition where the limit in 4.2.2.2.2.C is satisfied, and remeasure $F_Q^M(Z)$, or

(2) Reduce THERMAL POWER at least 1% for each 1% $F_Q(Z)$ exceeds the limit within 15 minutes and similarly reduce the Power Range Neutron Flux-High Trip Setpoints within the next 4 hours; POWER OPERATION may proceed for up to a total of 72 hours; subsequent POWER OPERATION may proceed provided the Overpower ΔT Trip Setpoints have been reduced at least 1% for each 1% $F_Q(Z)$ exceeds the limit. The Overpower ΔT Trip Setpoint reduction shall be performed with the reactor in at least HOT STANDBY. The percent that F_Q exceeds the limit shall be calculated as the maximum percent over the core height (Z) that $F_Q(Z)$ exceeds the limit using the following expression:

$$\left[\left[\frac{F_Q^M(Z) \times W(Z)_{BL}}{\frac{2.25}{P} \times K(Z)}\right] - 1\right] \times 100 \text{ for } P \geq APL^{ND}$$

c. Identify and correct the cause of the out-of-limit condition prior to increasing THERMAL POWER above the reduced limit required by ACTION a or b, above; THERMAL POWER may then be increased provided $F_Q(Z)$ is demonstrated through incore mapping to be within its limit.

SURVEILLANCE REQUIREMENTS

4.2.2.2.1 The provisions of Specification 4.0.4 are not applicable.

4.2.2.2.2 For RAOC operation, $F_Q(Z)$ shall be evaluated to determine if $F_Q(Z)$ is within its limit by:

a. Using the movable incore detectors to obtain a power distribution map at any THERMAL POWER greater than 5% of RATED THERMAL POWER.

b. Increasing the measured $F_Q(Z)$ component of the power distribution map by 3% to account for manufacturing tolerances and further increasing the value by 5% to account for measurement uncertainties. Verify the requirements of Specification 3.2.2.2 are satisfied.

c. Satisfy the following relationship:

$$F_Q^M(Z) \leq \frac{F_Q^{RTP} \times K(Z)}{P \times W(Z)} \text{ for } P > 0.375$$

$$F_Q^M(Z) \leq \frac{F_Q^{RTP} \times K(Z)}{W(Z) \times 0.375} \text{ for } P \leq 0.375$$

where $F_Q^M(Z)$ is the measured $F_Q(Z)$ increased by the allowances for manufacturing tolerances and measurement uncertainty, F_Q^{RTP} is the F_Q limit, K(Z) is the normalized $F_Q(Z)$ as a function of core height, P is the relative THERMAL POWER, and W(Z) is the cycle-dependent function that accounts for power distribution transients encountered during normal operation. F_Q^{RTP}, K(Z), and W(Z) are specified in the COLR as per Specification 6.9.1.6.

d. Measuring $F_Q^M(Z)$ according to the following schedule:

(1) Upon achieving equilibrium conditions after exceeding by 10% or more of RATED THERMAL POWER, the THERMAL POWER at which $F_Q(Z)$ was last determined,* or

(2) At least once per 31 Effective Full Power Days, whichever occurs first.

e. With the maximum value of

$$\frac{F_Q^M(Z)}{K(Z)}$$

over the core height (Z) increasing since the previous determination of $F_Q^M(Z)$, either of the following actions shall be taken:

(1) $F_Q^M(Z)$ shall be increased by 2% over that specified in Specification 4.2.2.2.2c, or

(2) $F_Q^M(Z)$ shall be measured at least once per 7 Effective Full Power Days until two successive maps indicate that the maximum value of

$$\frac{F_Q^M(Z)}{K(Z)}$$

over the core height (Z) is not increasing.

f. The limits specified in Specifications 4.2.2.2.2c and 4.2.2.2.2e are not applicable in the following core plane regions:

(1) Lower core region from 0% to 15%, inclusive.
(2) Upper core region from 85% to 100%, inclusive.

*During power escalation at the beginning of each cycle, the power level may be increased until a power level for extended operation has been achieved and power distribution map obtained.

SURVEILLANCE REQUIREMENTS (Continued)

4.2.2.2.3 Base load operation is permitted at powers above APL^{ND} if the following conditions are satisfied:

a. Prior to entering base load operation, maintain THERMAL POWER above APL^{ND} and less than or equal to that allowed by Specification 4.2.2.2.2 for at least the previous 24 hours. Maintain base load operation surveillance (AFD within the target band limit about the target flux difference of Specification 3.2.1.2) during this time period.

   Base load operation is then permitted providing THERMAL POWER is maintained between APL^{ND} and APL^{BL} or between APL^{ND} and 100% (whichever is most limiting) and F_Q surveillance is maintained pursuant to Specification 4.2.2.2.4. APL^{BL} is defined as the minimum value of:

$$APL^{BL} = \frac{F_Q^{RTP} \times K(Z)}{F_Q^M(Z) \times W(Z)_{BL}} \times 100\%$$

   over the core height (Z) where: $F_Q^M(Z)$ is the measured $F_Q(Z)$ increased by the allowances for manufacturing tolerances and measurement uncertainty. The F_Q limit is F_Q^{RTP}. $W(Z)_{BL}$ is the cycle-dependent function that accounts for limited power distribution transient encountered during base load operation. F_Q^{RTP}, K(Z), and $W(Z)_{BL}$ are specified in the COLR as per Specification 6.9.1.6.

b. During base load operation, if the THERMAL POWER is decreased below APL^{ND} then the conditions of 4.2.2.2.3.a shall be satisfied before reentering base load operation.

4.2.2.2.4 During base load operation $F_Q(Z)$ shall be evaluated to determine if $F_Q(Z)$ is within its limit by:

a. Using the movable incore detectors to obtain a power distribution map at any THERMAL POWER above APL^{ND}.

b. Increasing the measured $F_Q(Z)$ component of the power distribution map by 3% to account for manufacturing tolerances and further increasing the value by 5% to account for measurement uncertainties. Verify the requirements of Specification 3.2.2.2 are satisfied.

c. Satisfying the following relationship:

$$F_Q^M(Z) \leq \frac{F_Q^{RTP} \times K(Z)}{P \times W(Z)_{BL}} \text{ for } P > APL^{ND}$$

where: $F_Q^M(Z)$ is the measured $F_Q(Z)$. The F_Q^{RTP} is the F_Q limit, the normalized $F_Q(Z)$ as a function of core height. P is the relative THERMAL POWER. $W(Z)_{BL}$ is the cycle-dependent function that accounts for limited power distribution transients encountered during base load operation. F_Q^{RTP}, K(Z), and $W(Z)_{BL}$ are specified in the COLR as per Specification 6.9.1.6.

d. Measuring $F_Q^M(Z)$ in conjunction with target flux difference determination according to the following schedule:

(1) Prior to entering base load operation after satisfying Section 4.2.2.2.3, unless a full core flux map has been taken in the previous 31 Effective Full Power Days with the relative THERMAL POWER having been maintained above APL^{ND} for the 24 hours prior to mapping, and

(2) At least once per 31 Effective Full Power Days.

e. With the maximum value of

$$\frac{F_Q^M(z)}{K(z)}$$

over the core height (Z) increasing since the previous determination of $F_Q^M(Z)$, either of the following actions shall be taken:

(1) $F_Q^M(Z)$ shall be increased by 2 percent over that specified in 4.2.2.2.4.c, or

(2) $F_Q^M(Z)$ shall be measured at least once per 7 Effective Full Power Days until 2 successive maps indicate that the maximum value of

$$\frac{F_Q^M(Z)}{K(Z)}$$

over the core height (Z) is not increasing.

f. The limits specified in 4.2.2.2.4.c and 4.2.2.2.4.e are not applicable in the following core plane regions:

(1) Lower core region 0% to 15%, inclusive.
(2) Upper core region 85% to 100%, inclusive.

4.2.2.2.5 When $F_Q(Z)$ is measured for reasons other than meeting the requirements of Specifications 4.2.2.2.2 or 4.2.2.2.4, an overall measured $F_Q(Z)$ shall be obtained from a power distribution map and increased by 3% to account for manufacturing tolerances and further increased by 5% to account for measurement uncertainty.

REACTOR COOLANT SYSTEM

COLD SHUTDOWN - LOOPS NOT FILLED

LIMITING CONDITION FOR OPERATION

3.4.1.4.2 Two residual heat removal (RHR) loops shall be OPERABLE* and at least one RHR loop shall be in operation.**

APPLICABILITY: MODE 5 with less than two reactor coolant loops filled.

ACTION:

a. With less than the above required RHR loops OPERABLE, immediately initiate corrective action to return the required RHR loops to OPERABLE status as soon as possible.

b. With no RHR loop in operation, suspend all operations involving a reduction in boron concentration of the Reactor Coolant System and immediately initiate corrective action to return the required RHR loop to operation.

SURVEILLANCE REQUIREMENTS

4.4.1.4.2.1 The required RHR loops shall be demonstrated OPERABLE pursuant to Specification 4.0.5.

4.4.1.4.2.2 At least one RHR loop shall be determined to be in operation and circulating reactor coolant at least once per 12 hours.

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*One RHR loop may be inoperable for up to 2 hours for surveillance testing provided the other RHR loop is OPERABLE and in operation.

**The RHR pump may be deenergized for up to 1 hour provided: (1) no operations are permitted that would cause dilution of the Reactor Coolant System boron concentration, and (2) core outlet temperature is maintained at least 10°F below saturation temperature.

3/4.9.1 BORON CONCENTRATION

LIMITING CONDITION FOR OPERATION

3.9.1.1 The boron concentration of all filled portions of the Reactor Coolant System and the refueling canal shall be maintained uniform and sufficient to ensure that the more restrictive of the following reactivity conditions is met; either:

a. A K_{eff} of 0.95 or less, or
b. A boron concentration of greater than or equal to 2600 ppm.

Additionally, the CVCS valves of Specification 4.1.1.2.2 shall be closed and secured in position.

APPLICABILITY: MODE 6.*

ACTION:

a. With the requirements of the above specification not satisfied, immediately suspend all operations involving CORE ALTERATIONS or positive reactivity changes and initiate and continue boration at greater than or equal to 33 gpm of a solution containing greater than or equal to 6300 ppm boron or its equivalent until K_{eff} is reduced to less than or equal to 0.95 or the boron concentration is restored to greater than or equal to 2600 ppm, whichever is the more restrictive.

b. With any of the CVCS valves of Specification 4.1.1.2.2 not closed** and secured in position, immediately close and secure the valves.

SURVEILLANCE REQUIREMENTS

4.9.1.1.1 The more restrictive of the above two reactivity conditions shall be determined prior to:

a. Removing or unbolting the reactor vessel head, and
b. Withdrawal of any full-length control rod in excess of 3 feet from its fully inserted position within the reactor vessel.

4.9.1.1.2 The boron concentration of the Reactor Coolant System and the refueling canal shall be determined by chemical analysis at least once per 72 hours.

4.9.1.1.3 The CVCS valves of Specification 4.1.1.2.2 shall be verified closed and locked at least once per 31 days.

*The reactor shall be maintained in MODE 6 whenever fuel is in the reactor vessel with the vessel head closure bolts less than fully tensioned or with the head removed.

**Except those opened under administrative control.

3/4.1 REACTIVITY CONTROL SYSTEMS

BASES

3/4.1.1 BORATION CONTROL

3/4.1.1.1 and 3/4.1.1.2 SHUTDOWN MARGIN

A sufficient SHUTDOWN MARGIN ensures that: (1) the reactor can be made subcritical from all operating conditions, (2) the reactivity transients associated with postulated accident conditions are controllable within acceptable limits, and (3) the reactor will be maintained sufficiently subcritical to preclude inadvertent criticality in the shutdown condition.

SHUTDOWN MARGIN requirements vary throughout core life as a function of fuel depletion, RCS boron concentration, and RCS T_{avg}. In MODES 1 and 2, the most restrictive condition occurs at EOL with T_{avg} at no load operating temperature, and is associated with a postulated steam line break accident and resulting uncontrolled RCS cooldown. In the analysis of this accident, a minimum SHUTDOWN MARGIN of 1.3% ΔK/K is required to control the reactivity transient. Accordingly, the SHUTDOWN MARGIN requirement is based upon this limiting condition and is consistent with FSAR safety analysis assumptions. In MODES 3, 4 and 5, the most restrictive condition occurs at BOL, associated with a boron dilution accident. In the analysis of this accident, a minimum SHUTDOWN MARGIN as defined in Specification 3/4.1.1.2 is required to allow the operator 15 minutes from the initiation of the Shutdown Margin Monitor alarm to total loss of SHUTDOWN MARGIN. Accordingly, the SHUTDOWN MARGIN requirement is based upon this limiting requirement and is consistent with the accident analysis assumption. The required SHUTDOWN MARGIN is plotted as a function of RCS critical boron concentration.

The locking closed of the required valves in MODE 5 (with the loops not filled) will preclude the possibility of uncontrolled boron dilution of the Reactor Coolant System by preventing flow of unborated water to the RCS.

3/4.1.1.3 MODERATOR TEMPERATURE COEFFICIENT

The limitations on moderator temperature coefficient (MTC) are provided to ensure that the value of this coefficient remains within the limiting condition assumed in the FSAR accident and transient analyses.

The MTC values of this specification are applicable to a specific set of plant conditions; accordingly, verification of MTC values at conditions other than those explicitly stated will require extrapolation to those conditions in order to permit an accurate comparison.

The most negative MTC, value equivalent to the most positive moderator density coefficient (MDC), was obtained by incrementally correcting the MDC used in the FSAR analyses to nominal operating conditions.

3/4.4.1 REACTOR COOLANT LOOPS AND COOLANT CIRCULATION

The plant is designed to operate in MODES 1 and 2 with three or four reactor coolant loops in operation and maintain DNBR greater than the design limit during all normal operations and anticipated transients. With less than the required reactor coolant loops in operation this specification requires that the plant be in at least HOT STANDBY within 6 hours.

In MODE 3, three reactor coolant loops, and in Mode 4, two reactor coolant loops provide sufficient heat removal capability for removing core decay heat even in the event of a bank withdrawal accident; however, a single reactor coolant loop provides sufficient heat removal capacity if a bank withdrawal accident can be prevented, i.e., by opening the Reactor Trip System breakers.

In MODE 4, and in MODE 5 with reactor coolant loops filled, a single reactor coolant loop or RHR loop provides sufficient heat removal capability for removing decay heat; but single failure considerations require that at least two loops (either RHR or RCS) be OPERABLE.

In MODE 5 with reactor coolant loops not filled, a single RHR loop provides sufficient heat removal capability for removing decay heat; but single failure considerations, and the unavailability of the steam generators as a heat removing component, require that at least two RHR loops be OPERABLE.

The operation of one reactor coolant pump (RCP) or one RHR pump provides adequate flow to ensure mixing, prevent stratification and produce gradual reactivity changes during boron concentration reductions in the Reactor Coolant System. The reactivity change rate associated with boron reduction will, therefore, be within the capability of operator recognition and control.

The restrictions on starting an RCP with one or more RCS cold legs less than or equal to 350°F are provided to prevent RCS pressure transients, caused by energy additions from the Secondary Coolant System, which could exceed the limits of Appendix G to 10 CFR Part 50. The RCS will be protected against overpressure transients and will not exceed the limits of Appendix G by either: (1) restricting the water volume in the pressurizer and thereby providing a volume for the reactor coolant to expand into, or (2) by restricting starting of the RCPs to when the secondary water temperature of each steam generator is less than 50°F above each of the RCS cold leg temperatures.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 99

TO FACILITY OPERATING LICENSE NO. NPF-49

NORTHEAST NUCLEAR ENERGY COMPANY, ET AL.

MILLSTONE NUCLEAR POWER STATION, UNIT NO. 3

DOCKET NO. 50-423

1.0 INTRODUCTION

By letter dated July 22, 1994 the Northeast Nuclear Energy Company (the licensee) submitted a request for changes to the Millstone Nuclear Power Station, Unit No. 3 Technical Specifications (TS). The requested changes would make three separate changes: (1) change the title of Figure 3.1-5 to be consistent with the applicable Limiting Condition For Operation (LCO), (2) relocate the Chemical and Volume Control System (CVCS) valve position requirements to the Reactivity Control Systems - Shutdown Margin specifications, and (3) consolidate action statements to be expressed in the LCOs rather than in Surveillance Requirements (SR). The amendment would also clarify the requirements for calculating the heat flux hot channel factor $F_Q(z)$ when using the base load option.

2.0 BACKGROUND

2.1 Power Distribution Limits

The licensee proposed TS changes that pertain to power distribution limits and the heat flux hot channel factor ($F_Q(Z)$). In order to separate applicable actions from SRs and place them in action statements, the licensee proposed changes to TS 3.2.2.1. Currently, the specified actions conflict with the designated LCO actions.

The purpose of the limits on the values of $F_Q(Z)$ is to limit the local (i.e., pellet) peak power density. The value of $F_Q(Z)$ varies along the axial height (Z) of the core. $F_Q(Z)$ is defined as the maximum local fuel rod linear power density divided by the average fuel rod linear power density, assuming nominal fuel pellet and fuel rod dimensions. Therefore, $F_Q(Z)$ is a measure of the peak fuel pellet power within the reactor core.

During power operation, the global power distribution is limited by LCO 3.2.1, "AXIAL FLUX DIFFERENCE (AFD)," and LCO 3.2.4, "QUADRANT POWER TILT RATIO (QPTR)," which are directly and continuously measured process variables. Therefore, these LCOs preserve core limits on a continuous basis.

$F_Q(Z)$ varies with fuel loading patterns, control bank insertion, fuel burnup, and changes in axial power distribution. $F_Q(Z)$ is measured periodically using the incore detector system. These measurements are generally taken with the core at or near steady state conditions. Using the measured three dimensional power distributions, it is possible to derive a measured value for $F_Q(Z)$. However, because this value represents a steady state condition, it does not include the variations in the value of $F_Q(Z)$ that are present during nonequilibrium situations such as load following.

The steady state value of the fundamental radial peaking factor (F_{xy}) is adjusted by an elevation dependent factor to account for the variations in $F_Q(Z)$ due to transient conditions. Core monitoring and control under nonsteady state conditions are accomplished by operating the core within the limits of the appropriate LCOs, including the limits on AFD, QPTR, and control rod insertion.

2.2 Editorial and Administrative Changes

The licensee identified certain typographical errors and subsequently provided corrected pages during the November 2, 1994 meeting with the NRC staff regarding instrument surveillance. The affected pages are 3/4 2-6, 3/4 2-7, 3/4 2-13, and 3/4 2-14. The content of these pages and the changes made neither expand the scope of the July 22, 1994 amendment request nor affect the initial proposed no significant hazards consideration determination.

2.2.1 Title Change of Figure 3.1-5

The licensee proposed to change the title of Figure 3.1-5, "Required Shutdown Margin for Mode 5 with RCS Loops Drained." The LCO in Section 3.1.1.2 applies to "loops not filled" and refers the reader to Figure 3.1.1.2. In order to establish continuity between the two items, the words "loops drained" in the title of Figure 3.1-5 are being changed to "loops not filled" as specified in its associated LCO in Section 3.1.1.2.

2.2.2 Relocation of CVCS Position Requirements

The licensee requested that several administrative changes be made to the TS regarding CVCS valve position requirements for reactivity control during cold shut down and refueling operations. The proposed change would allow the CVCS valve position requirements stated in Section 3.4.1.4.2 to be relocated in Section 3.1.1.2, "Reactivity Control Systems - Shutdown Margin - Cold Shutdown - Loops Not Filled". In doing so, 3.1.1.2 will include an additional action statement that explains the actions to be taken when the CVCS dilution flow paths are not closed and locked into position. Subsequently, SR 4.4.1.4.2.3 will be moved to SR 4.1.1.2.2 to address the surveillance procedures for the associated CVCS valves. Finally, TS 3/4.9.1.1 will be modified to refer to Section 4.1.1.2.2 that will contain the CVCS valve position requirements.

3.0 EVALUATION

3.1 Heat Flux Hot Channel Factor (TS 3.2.2.1)

TS 3.2.2.1.a.2, which requires reducing thermal power by ≥ 1% for each 1% by which $F_Q(Z)$ exceeds its limit, maintains an acceptable absolute power density. The completion time of 15 minutes provides an acceptable time to reduce power in an orderly manner and without allowing the plant to remain in an unacceptable condition for an extended period of time.

The bases for TS 3.2.2.1.a.1 are as follows. When core peaking factors are sufficiently high such that LCO 3.2.1 does not permit operation at Rated Thermal Power (RTP), the acceptable operation limits for AFD are scaled down. This percentage reduction is equal to the amount, expressed as a percentage, by which $F_Q(Z)$ exceeds its specified limit. This ensures a near constant maximum linear heat rate in units of kilowatts per foot at the acceptable operation limits. The Completion Time of 4 hours for the change in setpoints is sufficient, considering the small likelihood of a severe transient in this relatively short time period, and the preceding prompt reduction in thermal power in accordance with Required Action 3.2.2.1.a.2.

A reduction of the Power Range Neutron—High trip setpoints by ≥ 1% for each 1% by which $F_Q(Z)$ exceeds its specified limit, is a conservative action for protection against the consequences of severe transients with unanalyzed power distributions. The completion time of 8 hours is sufficient considering the small likelihood of a severe transient in this time period and the preceding prompt reduction in thermal power in accordance with Required Action Statement 3.2.2.1.a.2.

Reduction in the Overpower ΔT trip setpoints by ≥ 1% for each 1% by which $F_Q(Z)$ exceeds its limit, is a conservative action for protection against the consequences of severe transients with unanalyzed power distributions. The completion time of 72 hours is sufficient considering the small likelihood of a severe transient in this time period, and the preceding prompt reduction in thermal power in accordance with Required Action Statement 3.2.2.1.a.2.

Verification that $F_Q(Z)$ has been restored to within its limit, by performing SR 3.2.1.1 prior to increasing thermal power above the limit imposed by Required Action Statement 3.2.2.1.a.2, ensures that core conditions during operation at higher power levels are consistent with safety analyses assumptions.

If Required Actions 3.2.2.1.a.1 through 3.2.2.1.a.3 are not met within their associated completion times, the plant must be placed in a mode or condition in which the LCO requirements are not applicable. This is done by placing the plant in at least MODE 2 within 6 hours. This allowed Completion Time is reasonable based on operating experience regarding the amount of time it takes to reach MODE 2 from full power operation in an orderly manner and without challenging plant systems.

3.2 Editorial and Administrative Changes

The administrative changes do not alter the operation of the plant, and are further clarifications of the existing TS requirements. Based on the foregoing discussion, the NRC staff finds the proposed amendment changes acceptable.

4.0 STATE CONSULTATION

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

5.0 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 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 45029). 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.

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

Principal Contributor: Maudette Griggs

Date: December 29, 1994