October 21, 1998

Mr. Martin L. Bowling, Jr.
Recovery Officer - Technical Services
Northeast Nuclear Energy Company
c/o Ms. Patricia A. Loftus
Director - Regulatory Affairs
P. O. Box 128
Waterford, Connecticut 06385

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SUBJECT: ISSUANCE OF AMENDMENT - MILLSTONE NUCLEAR POWER STATION, UNIT NO. 3 (TAC NO. M98699)

Dear Mr. Bowling:

The Commission has issued the enclosed Amendment No. 164 to Facility Operating License No. NPF-49 for the Millstone Nuclear Power Station, Unit No. 3, in response to your application dated May 9, 1997, as supplemented August 4, 1998.

The amendment revises the shutdown margin requirements and adds Technical Specification 3/4.3.5 to provide the limiting condition for operation and surveillance requirements for the shutdown margin monitors. The amendment also makes administrative changes and revises the associated Bases section.

In approving the proposed action, the NRC staff relied upon your commitment that (1) Millstone Unit 3 will incorporate into TS 6.9.1.6, references to the shutdown margin analysis methods reviewed and approved by the NRC; and (2) the proposed change to TS 6.9.1.6 will be submitted to the NRC within 90 days of the date of this letter. An appropriate license condition has been added, reflecting these commitments. You are requested to inform the staff in writing when this commitment has been implemented.

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

Sincerely,
Original signed by:

James W. Andersen, Project Manager
Millstone Project Directorate
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket No. 50-423

Enclosures: 1. Amendment No. 164 to NPF-49
2. Safety Evaluation

cc w/encls: See next page

DOCUMENT NAME: G:\Andersen\98699.wpd *See previous concurrence

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

October 21, 1998

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Recovery Officer - Technical Services
Northeast Nuclear Energy Company
c/o Ms. Patricia A. Loftus
Director - Regulatory Affairs
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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. 164
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 May 9, 1997, as supplemented August 4, 1998, 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 Facility Operating License and 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. 164, 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.

In addition, paragraph 2.C.(5) of Facility Operating License No. NPF-49 is amended to read as follows:

(5) The Additional Conditions contained in Appendix C, as revised through Amendment No. 164, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the additional conditions.

3. This license amendment is effective as of the date of issuance, to be implemented within 60 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

William M. Dean, Director
Millstone Project Directorate
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Facility Operating License
and Technical Specifications

Date of Issuance: October 21, 1998

ATTACHMENT TO LICENSE AMENDMENT NO. 164

FACILITY OPERATING LICENSE NO. NPF-49

DOCKET NO. 50-423

Replace the following page of the Facility Operating License with the attached page. The revised page is identified by amendment number and contains a vertical line indicating the area of change.

Remove	Insert
Appendix C	Appendix C

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

Remove	Insert
vii	vii
xiii	xiii
3/4 1-3	3/4 1-3
3/4 1-4	3/4 1-4
3/4 1-5	3/4 1-5
3/4 1-6	3/4 1-6
3/4 1-7	3/4 1-7
3/4 1-8	3/4 1-8
3/4 1-9	3/4 1-9
3/4 3-4	3/4 3-4
3/4 3-5	3/4 3-5
3/4 3-6	3/4 3-6
3/4 3-12	3/4 3-12
3/4 3-14	3/4 3-14
-	3/4 3-82
-	3/4 3-83
B 3/4 1-3	B 3/4 1-3
B 3/4 3-3	B 3/4 3-3
B 3/4 3-3a	-
B 3/4 3-3b	-
-	B 3/4 3-7
-	B 3/4 3-8
-	B 3/4 3-9
6-20a	6-20a

APPENDIX C

ADDITIONAL CONDITIONS
OPERATING LICENSE NO. NPF-49

Northeast Nuclear Energy Company (NNECO) shall comply with the following conditions on the schedules noted below:

Amendment Number	Additional Condition	Condition Completion Date
162	Millstone Unit No. 3 will incorporate the changes into the Final Safety Analysis Report (FSAR) as requested by letter dated January 22, 1998, as supplemented by letter dated July 17, 1998, that accepts the use of epoxy coatings on service water system components. Future changes to the design described in this submittal may be made in accordance with the provisions of 10 CFR 50.59.	During the next revision of the FSAR required by 10 CFR 50.71(e) or no later than June 30, 1999.
164	Millstone Unit No. 3 will incorporate into Technical Specification 6.9.1.6, references to the shutdown margin analysis methods reviewed and approved by the NRC.	To be submitted to the NRC within 90 days from October 21, 1998.

INDEX

BASES

3/4.1 REACTIVITY CONTROL SYSTEMS

3/4.1.1 BORATION CONTROL

SHUTDOWN MARGIN - MODES 3, 4 AND 5 LOOPS FILLED

LIMITING CONDITION FOR OPERATION

3.1.1.1.2 The SHUTDOWN MARGIN shall be greater than or equal to the limits shown in Figures 3.1-1, 3.1-3 and 3.1-4 for four loop operation and in Figure 3.1-2 for three loop operation.*

APPLICABILITY: MODES 3, 4 and 5

ACTION:

With the SHUTDOWN MARGIN less than the required value, immediately initiate and continue boration at greater than or equal to 33 gpm of a solution containing greater than or equal to 6600 ppm boron or equivalent until the required SHUTDOWN MARGIN is restored.

SURVEILLANCE REQUIREMENTS

4.1.1.1.2.1 The SHUTDOWN MARGIN shall be determined to be greater than or equal to the required value:

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 above required 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.

4.1.1.1.2.2 Valve 3CHS-V305 shall be verified closed and locked at least once per 31 days.

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*Additional SHUTDOWN MARGIN requirements, if required, are given in Specification 3.3.5.

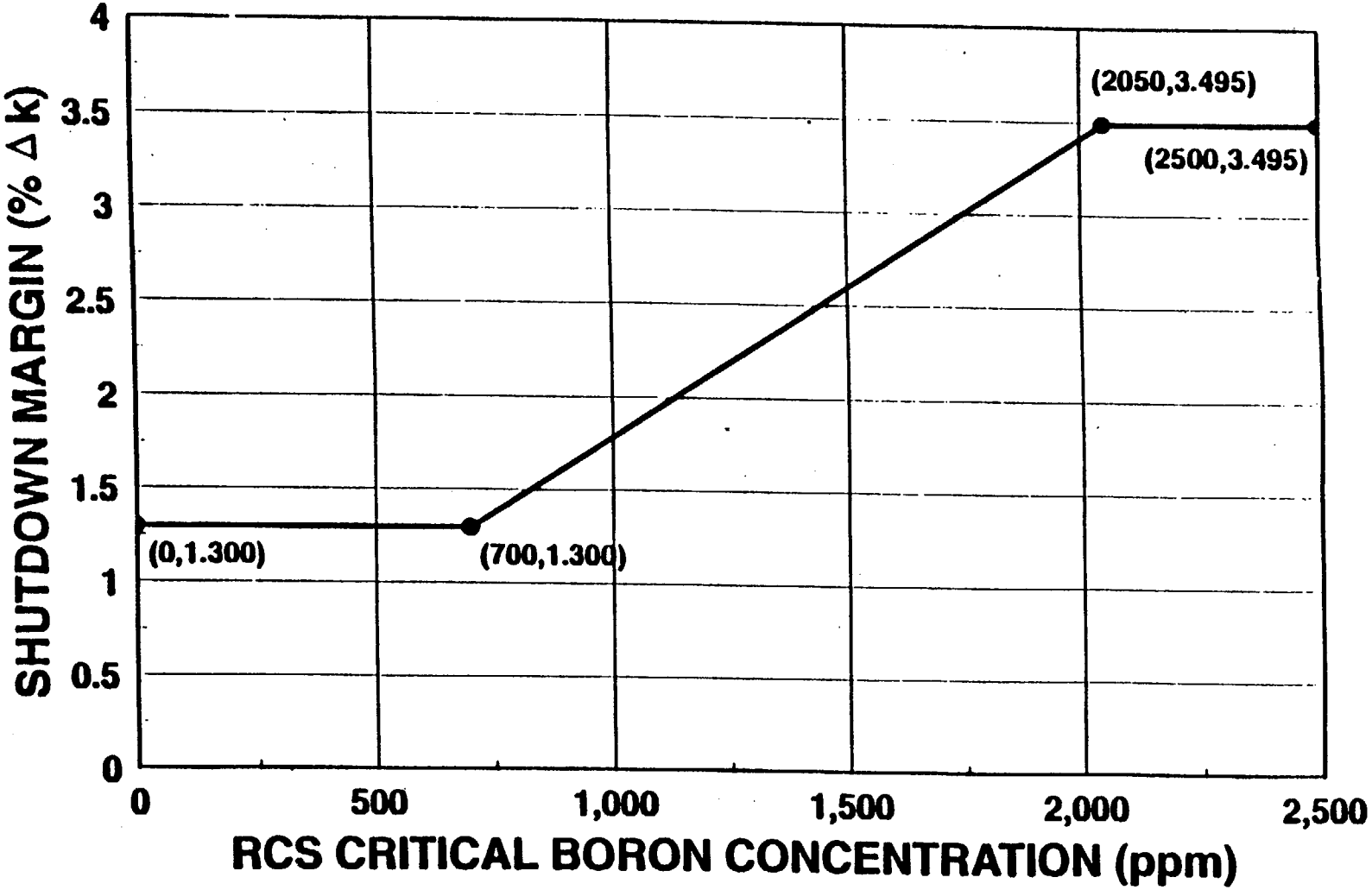

FIGURE 3.1-1

REQUIRED SHUTDOWN FOR MODE 3 WITH FOUR LOOPS IN OPERATION

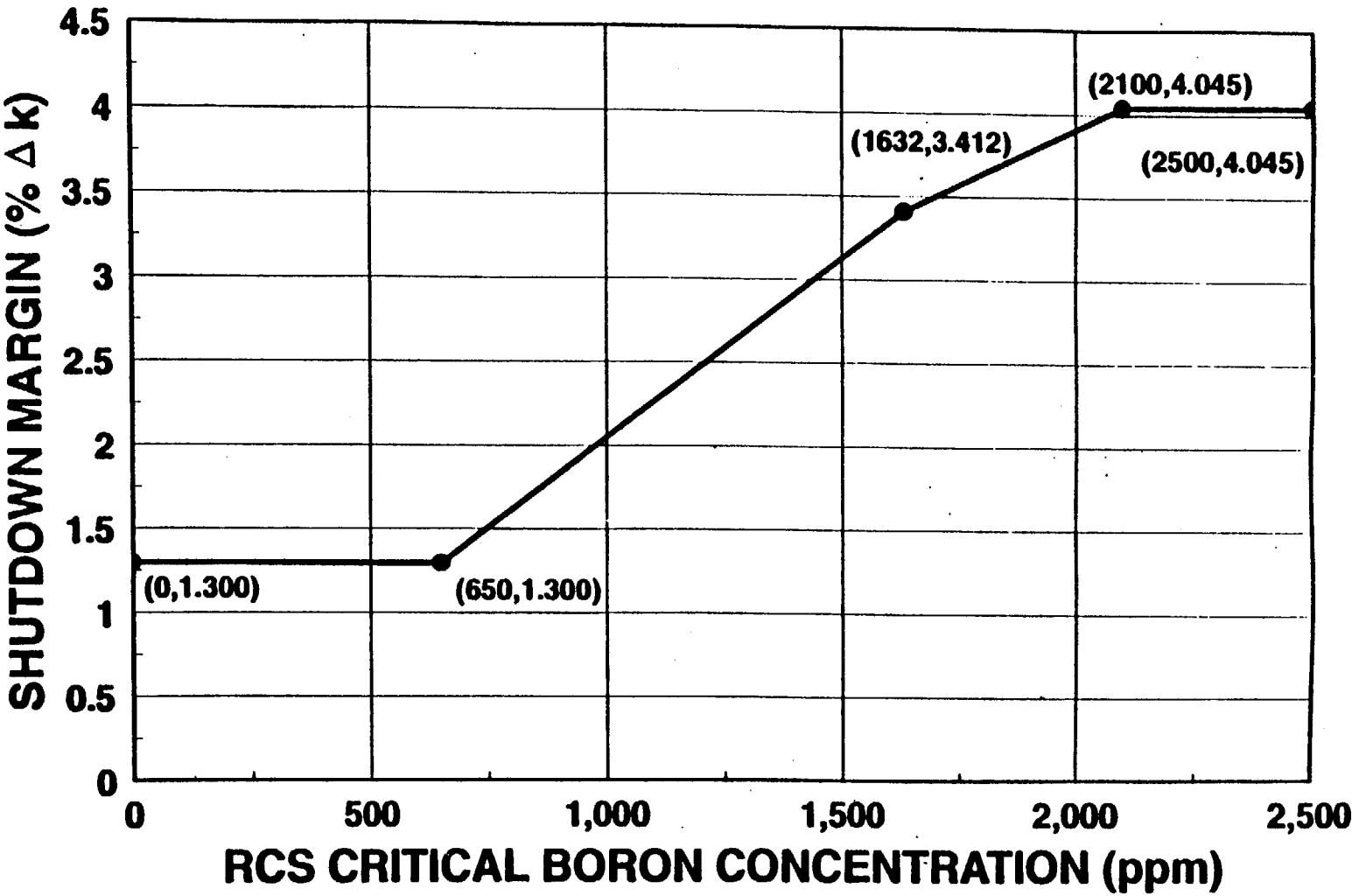

FIGURE 3.1-2

REQUIRED SHUTDOWN MARGIN FOR MODE 3 WITH THREE LOOPS IN OPERATION

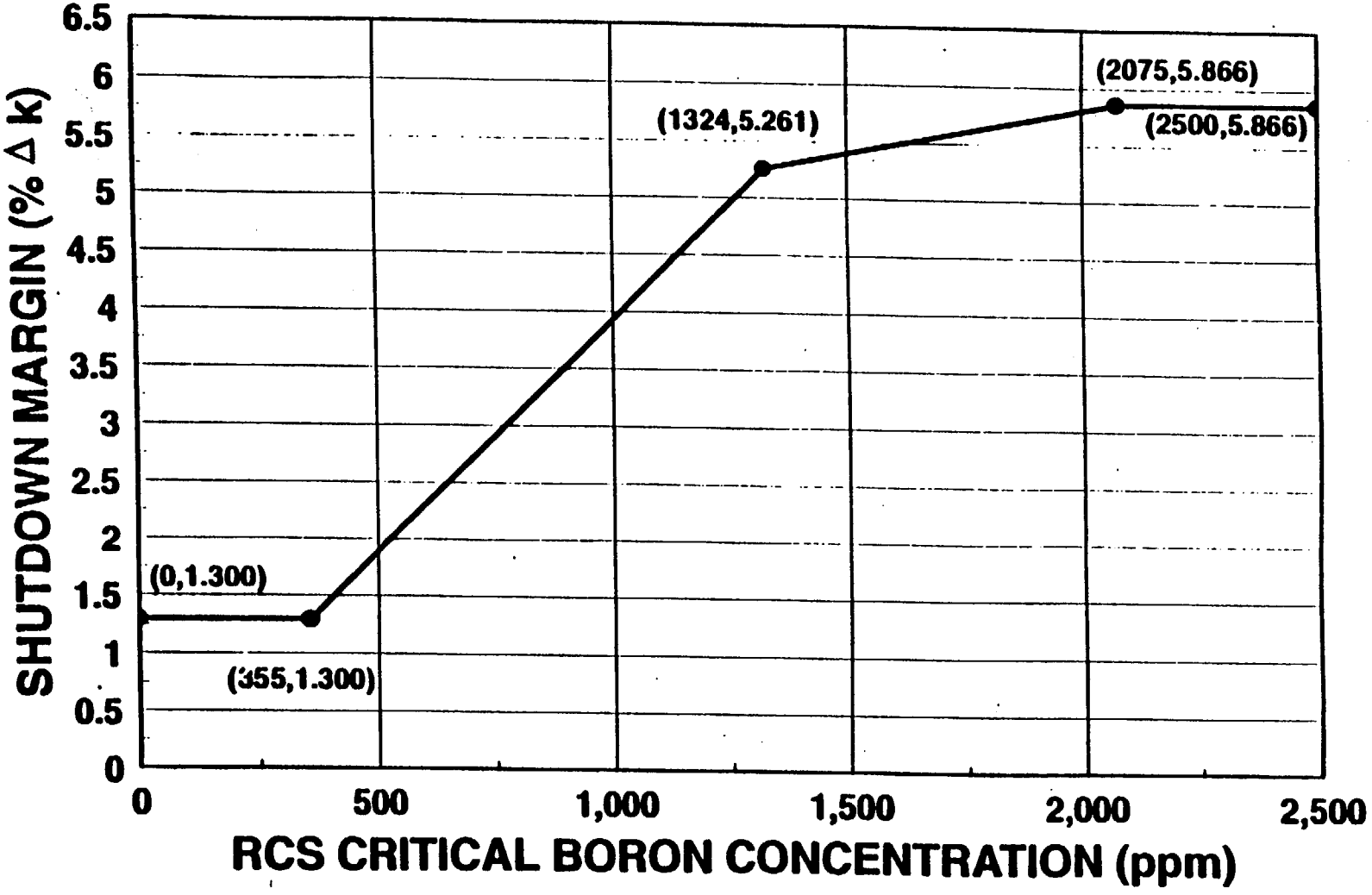

FIGURE 3.1-3

REQUIRED SHUTDOWN MARGIN FOR MODE 4

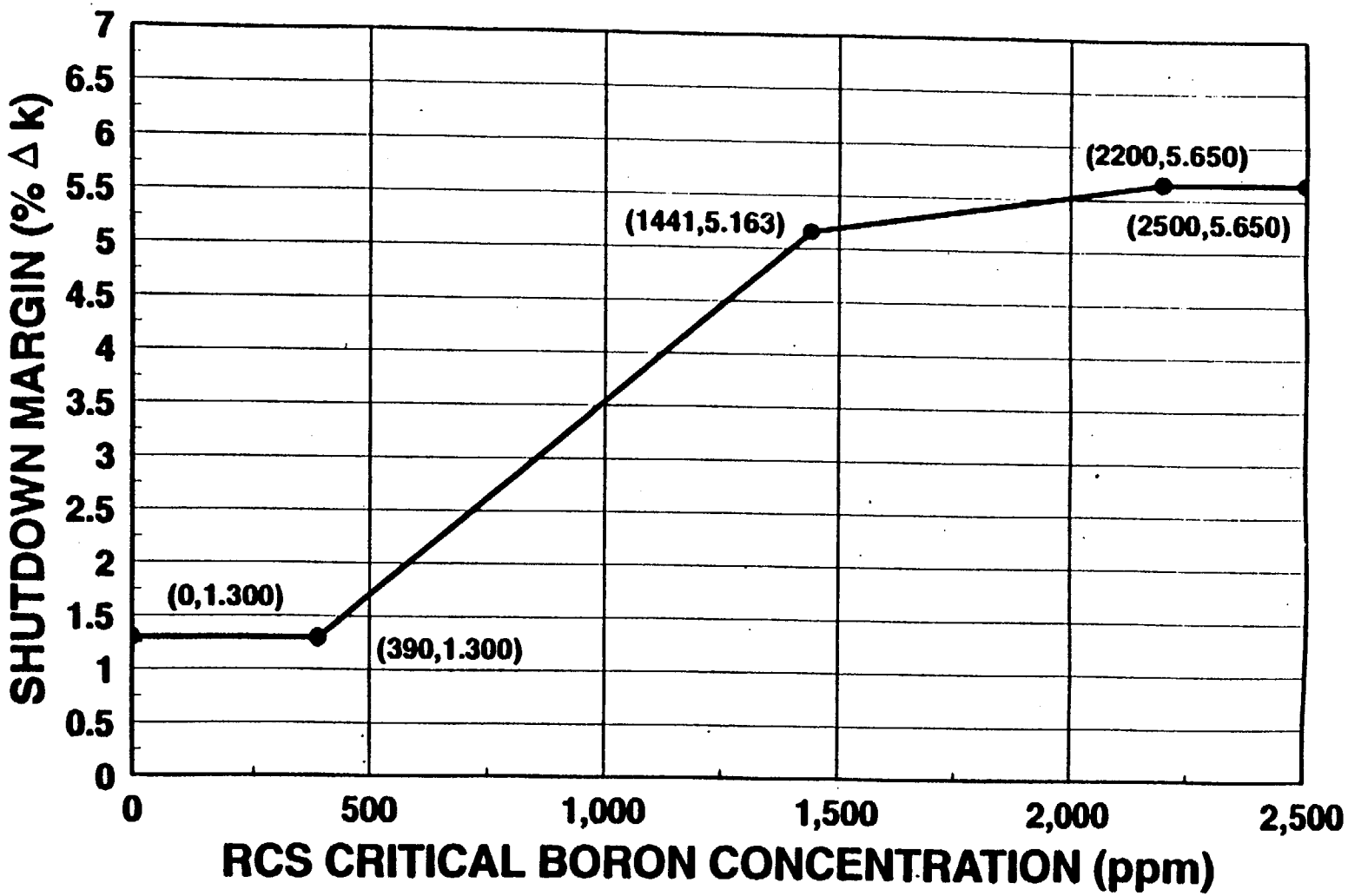

FIGURE 3.1-4

REQUIRED SHUTDOWN MARGIN FOR MODE 5 WITH RCS LOOPS FILLED

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 solution containing greater than or equal to 6600 ppm boron or equivalent until 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,

---

*Additional SHUTDOWN MARGIN requirements, if required, are given in Specification 3.3.5.

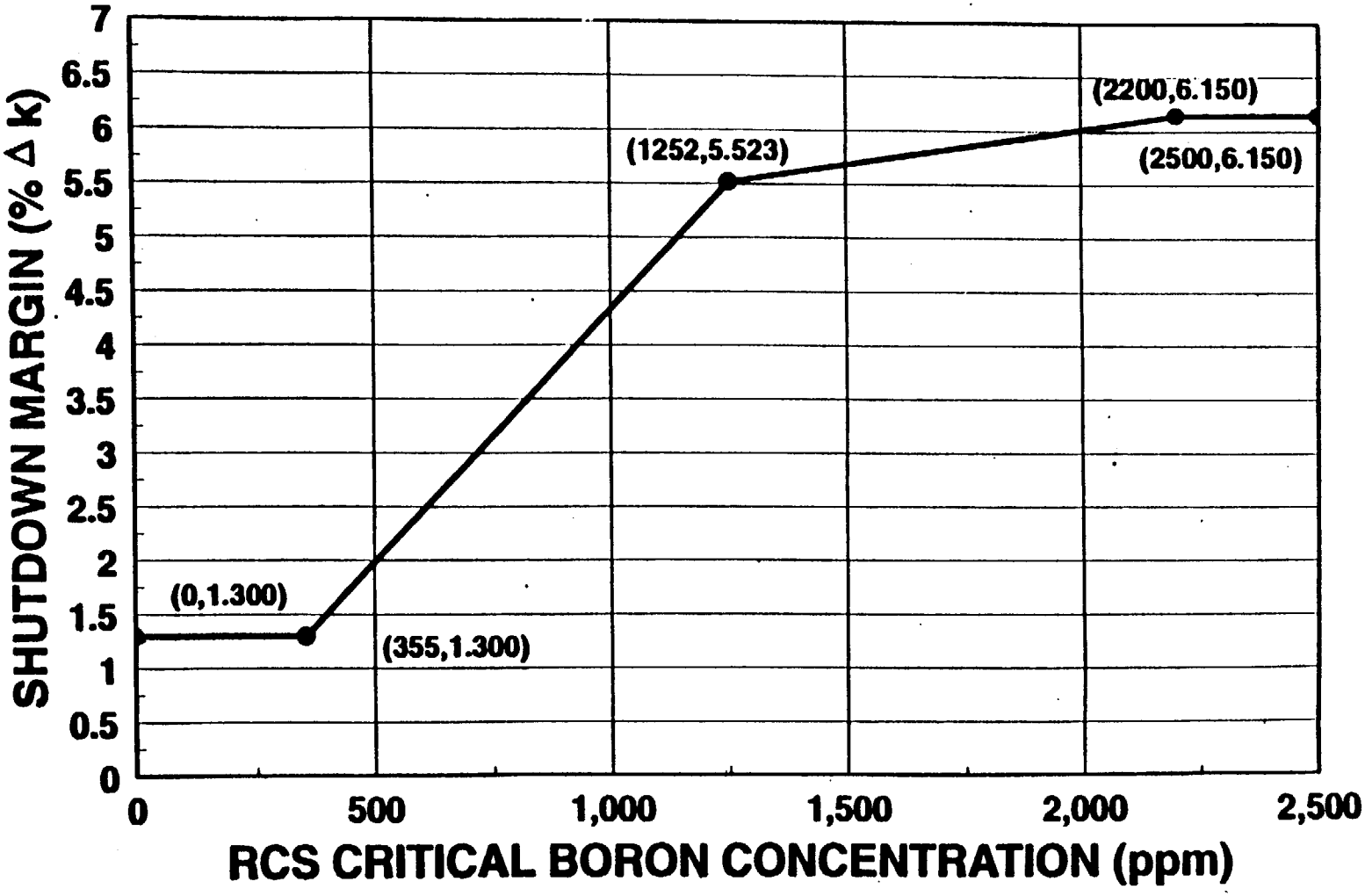

FIGURE 3.1-5
REQUIRED SHUTDOWN MARGIN FOR MODE 5 WITH RCS LOOPS NOT FILLED

TABLE 3.3-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION

FUNCTIONAL UNIT	TOTAL NO. OF CHANNELS	CHANNELS TO TRIP	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ACTION
17. Reactor Trip System Interlocks (Continued)					
c. Power Range Neutron Flux, P-8	4	2	3	1	8
d. Power Range Neutron Flux, P-9	4	2	3	1	8
e. Power Range Neutron Flux, P-10	4	2	3	1,2	8
18. Reactor Trip Breakers(2)	2 2	1 1	2 2	1, 2 3*, 4*, 5*	10, 13 11
19. Automatic Trip and Interlock Logic	2 2	1 1	2 2	1, 2 3*, 4*, 5*	13A 11
20. Three Loop Operation Bypass Circuitry	8 (1 switch per loop in each train)	2 (From different loop switches in bypass)	8	1, 2	1
21. DELETED					

Amendment No. 57, 60, 70, 93, 164

TABLE 3.3-1 (Continued)

TABLE NOTATIONS

*When the Reactor Trip System breakers are in the closed position and the Control Rod Drive System is capable of rod withdrawal.

**Above the P-7 (At Power) Setpoint.

***Above the P-9 (Reactor Trip/Turbine Trip Interlock) Setpoint.

##Below the P-6 (Intermediate Range Neutron Flux Interlock) Setpoint.

###Below the P-10 (Low Setpoint Power Range Neutron Flux Interlock) Setpoint.

(1) The applicable MODES and ACTION statements for these channels noted in Table 3.3-3 are more restrictive and, therefore, applicable.

(2) Including any reactor trip bypass breakers that are racked in and closed for bypassing a reactor trip breaker.

ACTION STATEMENTS

ACTION 1 - With the number of OPERABLE channels one less than the Minimum Channels OPERABLE requirement, restore the inoperable channel to OPERABLE status within 48 hours or be in HOT STANDBY within the next 6 hours.

ACTION 2 - With the number of OPERABLE channels one less than the Total Number of Channels, STARTUP and/or POWER OPERATION may proceed provided the following conditions are satisfied:

a. The inoperable channel is placed in the tripped condition within 6 hours,

b. The Minimum Channels OPERABLE requirement is met; however, the inoperable channel may be bypassed for up to 4 hours for surveillance testing of other channels per Specification 4.3.1.1, and

c. Either, THERMAL POWER is restricted to less than or equal to 75% of RATED THERMAL POWER for four loop operation or 50% of RATED THERMAL POWER for three loop operation and the Power Range Neutron Flux Trip Setpoint is reduced to less than or equal to 85 % of RATED THERMAL POWER for four loop operation or 60% of RATED THERMAL POWER for three loop operation within 4 hours; or, the QUADRANT POWER TILT RATIO is monitored at least once per 12 hours per Specification 4.2.4.2.

TABLE 3.3-1 (Continued)

ACTION STATEMENTS (Continued)

ACTION 3 - With the number of channels OPERABLE one less than the Minimum Channels OPERABLE requirement and with the THERMAL POWER level:

a. Below the P-6 (Intermediate Range Neutron Flux Interlock) Setpoint, restore the inoperable channel to OPERABLE status prior to increasing THERMAL POWER above the P-6 Setpoint, and

b. Above the P-6 (Intermediate Range Neutron Flux Interlock) Setpoint but below 10% of RATED THERMAL POWER, restore the inoperable channel to OPERABLE status prior to increasing THERMAL POWER above 10% of RATED THERMAL POWER.

ACTION 4 - With the number of OPERABLE channels one less than the Minimum Channels OPERABLE requirement, suspend all operations involving positive reactivity changes.

ACTION 5 - (Not used)

ACTION 6 - With the number of OPERABLE channels one less than the Total Number of Channels, STARTUP and/or POWER OPERATION may proceed provided the following conditions are satisfied:

a. The inoperable channel is placed in the tripped condition within 6 hours, and

b. The Minimum Channels OPERABLE requirement is met; however, the inoperable channel may be bypassed for up to 4 hours for surveillance testing of other channels per Specification 4.3.1.1.

ACTION 7 - (Not used)

ACTION 8 - With less than the Minimum Number of Channels OPERABLE, within 1 hour determine by observation of the associated permissive annunciator window(s) that the interlock is in its required state for the existing plant condition, or apply Specification 3.0.3.

TABLE 4.3-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION SURVEILLANCE REQUIREMENTS

FUNCTIONAL UNIT	CHANNEL CHECK	CHANNEL CALIBRATION	ANALOG CHANNEL OPERATIONAL TEST	TRIP ACTUATING DEVICE OPERATIONAL TEST	ACTUATION LOGIC TEST	MODES FOR WHICH SURVEILLANCE IS REQUIRED
18. Reactor Trip Breaker	N.A.	N.A.	N.A.	M(7, 11)	N.A.	1, 2, 3*, 4*, 5*
19. Automatic Trip and Interlock Logic	N.A.	N.A.	N.A.	N.A.	M(7)	1, 2, 3*, 4*, 5*
20. Three Loop Operation Bypass Circuitry	N.A.	N.A.	N.A.	R	N.A.	1, 2
21. Reactor Trip Bypass Breaker	N.A.	N.A.	N.A.	M(7, 15) R(16)	N.A.	1, 2, 3*, 4*, 5*
22. DELETED						

Amendment No. 99, 79, 93, 109, 164

TABLE 4.3-1 (Continued)

TABLE NOTATIONS (Continued)

(10) Setpoint verification is not applicable.

(11) The TRIP ACTUATING DEVICE OPERATIONAL TEST shall independently verify the OPERABILITY of the undervoltage and shunt trip attachments of the Reactor Trip Breakers.

(12) (not used)

(13) Reactor Coolant Pump Shaft Speed Sensor may be excluded from CHANNEL CALIBRATION.

(14) The TRIP ACTUATING DEVICE OPERATIONAL TEST shall independently verify the OPERABILITY of the undervoltage and shunt trip circuits for the Manual Reactor Trip Function. The test shall also verify the OPERABILITY of the Bypass Breaker trip circuit(s).

(15) Local manual shunt trip prior to placing breaker in service.

(16) Automatic undervoltage trip.

(17) (not used).

(18) The surveillance frequency and/or MODES specified for these channels in Table 4.3-2 should be reviewed for applicability.

3/4.3.5 SHUTDOWN MARGIN MONITOR

LIMITING CONDITION FOR OPERATION

3.3.5 Two channels of Shutdown Margin Monitors shall be OPERABLE

a. With a minimum count rate as designated in the CORE OPERATING LIMITS REPORT (COLR), or

b. If the minimum count rate in Specification 3.3.5.a cannot be met, then the Shutdown Margin Monitors may be made operable with a lower minimum count rate, as specified in the COLR, by borating the Reactor Coolant System above the requirements of Specification 3.1.1.1.2 or 3.1.1.2. The additional boration shall be:

1. A minimum of 150 ppm above the SHUTDOWN MARGIN requirements of Figure 3.1-1 (Mode 3 - 4 loops in operation) and Figure 3.1-2 (Mode 3 - 3 loops in operation), or

2. A minimum of 350 ppm above the SHUTDOWN MARGIN requirements of Figure 3.1-3 (Mode 4), Figure 3.1-4 (Mode 5 - RCS loops filled) and Figure 3.1-5 (Mode 5 - RCS loops drained).

APPLICABILITY: MODES 3*, 4, and 5.

ACTION:

a. With one Shutdown Margin Monitor inoperable, restore the inoperable channel to OPERABLE status within 48 hours.

b. With both Shutdown Margin Monitors inoperable or one Shutdown Margin Monitor inoperable for greater than 48 hours, immediately suspend all operations involving positive reactivity changes via dilution and rod withdrawal. Verify the valves listed in Specification 4.1.1.2.2 are closed and secured in position within the next 4 hours and at least once per 14 days thereafter.** Verify compliance with the SHUTDOWN MARGIN requirements of Specification 3.1.1.1.2 or 3.1.1.2, as applicable, within 1 hour and at least once per 12 hours thereafter.

---

* The shutdown margin monitors may be blocked during reactor startup in accordance with approved plant procedures.

**The valves may be opened on an intermittent basis under administrative controls as noted in Surveillance 4.1.1.2.2.

3/4.3.5 SHUTDOWN MARGIN MONITOR (continued)

SURVEILLANCE REQUIREMENTS

4.3.5 a. Each of the above required shutdown margin monitoring instruments shall be demonstrated OPERABLE by an ANALOG CHANNEL OPERATIONAL TEST at least once per 92 days that shall include verification that the Shutdown Margin Monitor is set per the Core Operating Limits Report (COLR).

b. At least once per 24 hours VERIFY the minimum count rate (counts/sec) as defined within the COLR.

BORATION SYSTEMS (Continued)

MARGIN from expected operating conditions equivalent to that required by Figure 3.1-4 after xenon decay and cooldown to 200°F. The maximum boration capability (minimum boration volume) requirement is established to conservatively bound expected operating conditions throughout core operating life. The initial RCS boron concentration is based on a minimum expected hot full power or hot zero power condition (peak xenon). The final RCS boron concentration assumes that the most reactive control rod is not inserted into the core. This set of conditions requires a minimum usable volume of 21,802 gallons of 6600 ppm borated water from the boric acid storage tanks or 1,166,000 gallons of 2700 ppm borated water from the refueling water storage tank (RWST). A minimum RWST volume of 1,166,000 gallons is specified to be consistent with ECCS requirement.

With the plant in MODE 4, one boron injection flowpath is acceptable without single failure consideration for emergency boration requirements on the basis of the stable reactivity condition of the reactor, the emergency power supply requirement for the OPERABLE charging pump, and the fact that the plant is administratively borated to at least MODE 5 requirements prior to cooldown to MODE 4. Also, the primary grade water addition path to the charging pumps is surveilled to be locked closed to prevent a direct dilution accident in MODE 4.

With the plant in MODES 5 and 6, one boron injection system is acceptable without single failure consideration on the basis of the stable reactivity condition of the reactor and the additional restrictions prohibiting CORE ALTERATIONS and positive reactivity changes in the event the single boron injection system becomes inoperable.

The limitation for a maximum of one centrifugal charging pump to be OPERABLE, when cold overpressure protection is in service, provides assurance that a mass addition pressure transient can be relieved by operation of a single PORV or RHR suction relief valve.

The boron capability required below 200°F is sufficient to provide a SHUTDOWN MARGIN of 1.3% $\Delta k/k$ after xenon decay and cooldown from 200°F to 140°F. This condition requires either a usable volume of 4100 gallons of 6600 ppm borated water from the boric acid storage tanks or 250,000 gallons of 2700 ppm borated water from the RWST. The unusable volume in each boric acid storage tank is 1300 gallons.

The contained water volume limits include allowance for water not available because of discharge line location and other physical characteristics.

The limits on contained water volume and boron concentration of the RWST also ensure a pH value of between 7.0 and 7.5 for the solution recirculated within containment after a LOCA. This pH band minimizes the evolution of iodine and minimizes the effect of chloride and caustic stress corrosion on mechanical systems and components.

The minimum RWST solution temperature for MODES 5 and 6 is based on analysis assumptions in addition to freeze protection considerations. The minimum/maximum RWST solution temperatures for MODES 1, 2, 3 and 4 are based on analysis assumptions.

REACTOR TRIP SYSTEM INSTRUMENTATION and ENGINEERED SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION (Continued)

The Engineered Safety Features Actuation System interlocks perform the following functions:

P-4 Reactor tripped - Actuates Turbine trip, closes main feedwater valves on T_{avg} below Setpoint, prevents the opening of the main feedwater valves which were closed by a Safety Injection or High Steam Generator Water Level signal, allows Safety Injection block so that components can be reset or tripped.

Reactor not tripped - prevents manual block of Safety Injection.

P-11 On increasing pressurizer pressure, P-11 automatically reinstates Safety Injection actuation on low pressurizer pressure and low steam line pressure. On decreasing pressure, P-11 allows the manual block of Safety Injection actuation on low pressurizer pressure and low steam line pressure.

P-12 On increasing reactor coolant loop temperature, P-12 automatically provides an arming signal to the Steam Dump System. On decreasing reactor coolant loop temperature, P-12 automatically removes the arming signal from the Steam Dump System.

P-14 On increasing steam generator water level, P-14 automatically trips all feedwater isolation valves, main feed pumps and main turbine, and inhibits feedwater control valve modulation.

3/4.3.3 MONITORING INSTRUMENTATION

3/4.3.3.1 RADIATION MONITORING FOR PLANT OPERATIONS

The OPERABILITY of the radiation monitoring instrumentation for plant operations ensures that: (1) the associated action will be initiated when the radiation level monitored by each channel or combination thereof reaches its Setpoint, (2) the specified coincidence logic is maintained, and (3) sufficient redundancy is maintained to permit a channel to be out-of-service for testing or maintenance. The radiation monitors for plant operations senses radiation levels in selected plant systems and locations and determines whether or not predetermined limits are being exceeded. If they are, the signals are combined into logic matrices sensitive to combinations indicative of various accidents and abnormal conditions. Once the required logic combination is completed, the system sends actuation signals to initiate alarms.

3/4 3.5 SHUTDOWN MARGIN MONITOR

The Shutdown Margin Monitors provide an alarm that a Boron Dilution Event may be in progress. The minimum count rate of Specification 3/4.3.5 and the SHUTDOWN MARGIN requirements of Figures 3.1-1, 3.1-2, 3.1-3, 3.1-4, and 3.1-5 ensure that at least 15 minutes are available for operator action from the time of the Shutdown Margin Monitor alarm to total loss of shutdown margin. By borating an additional 150 ppm above the SHUTDOWN MARGIN required by Figure 3.1-1 or 3.1-2, or 350 ppm above the SHUTDOWN MARGIN required by Figure 3.1-3, 3.1-4, or 3.1-5, lower values of minimum count rate are accepted.

Shutdown Margin Monitors

Background:

The purpose of the Shutdown Margin Monitors (SMM) is to annunciate an increase in core subcritical multiplication allowing the operator at least 15 minutes response time to mitigate the consequences of the inadvertent addition of unborated primary grade water (boron dilution event) into the Reactor Coolant System (RCS) when the reactor is shut down (Modes 3, 4, and 5).

The SMMs utilizes two channels of source range instrumentation (GM detectors). Each channel provides a signal to its applicable train of SMM. The SMM channel uses the last 600 or more counts to calculate the count rate and updates the measurement after 30 new counts or 1 second, whichever is longer. Each channel has 20 registers that hold the counts (20 registers X 30 count = 600 counts) for averaging the rate. As the count rate decreases, the longer it takes to fill the registers (fill the 30 count minimum). As the instrument's measured count rate decreases, the delay time in the instrument's response increases. This delay time leads to the requirement of a minimum count rate for OPERABILITY.

During the dilution event, count rate will increase to a level above the normal steady state count rate. When this new count rate level increases above the instrument's setpoint, the channel will alarm alerting the operator of the event.

Applicable Safety Analysis

The SMM senses abnormal increases in the source range count per second and alarms the operator of an inadvertent dilution event. This alarm will occur at least 15 minutes prior to the reactor achieving criticality. This 15 minute window allows adequate operator response time to terminate the dilution, FSAR Section 15.4.6.

LCO

LCO 3.3.5 provides the requirements for OPERABILITY of the instrumentation of the SMMs that are used to mitigate the boron dilution event. Two trains are required to be OPERABLE to provide protection against single failure.

Applicability

The SMM must be OPERABLE in MODES 3, 4, and 5 because the safety analysis identifies this system as the primary means to alert the operator and mitigate the event. The SMMs are allowed to be blocked during start up activities in MODE 3 in accordance with approved plant procedures. The alarm is blocked to allow the SMM channels to be used to monitor the 1/M approach to criticality.

The SMM are not required to be operable in MODES 1 and 2 as other RPS is credited with accident mitigation, over temperature delta temperature and power range neutron flux high (low setpoint of 25 percent RTP) respectively. The SMMs are not required to be OPERABLE in Mode 6 as the dilution event is precluded by administrative controls over all dilution flow paths (Technical Specification 4.1.1.2.2).

Actions

Channel inoperability of the SMMs can be caused by failure of the channel's electronics, failure of the channel to pass its calibration procedure, or by the channel's count rate falling below the minimum count rate for operability. This can occur when the count rate is so low that the channel's delay time is in excess of that assumed in the safety analysis. In any of the above conditions, the channel must be declared inoperable and the appropriate action statement entered. If the SMMs are declared inoperable due to low count rates, an RCS heatup will cause the SMM channel count rate to increase to above the minimum count rate for operability. Allowing the plant to increase modes will actually return the SMMs to OPERABLE status. Once the SMM channels are above the minimum count rate for operability, the channels can be declared operable and the LCO action statements can be exited.

LCO 3.3.5, Action a. - With one train of SMM inoperable, Action a. requires the inoperable train to be returned to OPERABLE status within 48 hours. In this condition, the remaining SMM train is adequate to provide protection. If the above required action cannot be met, alternate compensatory actions must be performed to provide adequate protection from the boron dilution event. All operations involving positive reactivity changes associated with RCS dilutions and rod withdrawal must be suspended, and all dilution flowpaths must be closed and secured in position (locked closed per Technical Specification 4.1.1.2.2) within the following 4 hours.

LCO 3.3.5, Action b. - With both trains of SMM inoperable, alternate protection must be provided:

1. Positive reactivity operations via dilutions and rod withdrawal are suspended. The intent of this action is to stop any planned dilutions of the RCS. The SMMs are not intended to monitor core reactivity during RCS temperature changes. The alarm setpoint is routinely reset during the plant heatup due to the increasing count rate. During cooldowns as the count rate decreases, baseline count rates are continually lowered automatically by the SMMs. The Millstone Unit No. 3 boron dilution analysis assumes steady state RCS temperature conditions.

2. All dilution flowpaths are isolated and placed under administrative control (locked closed). This action provides redundant protection and defense in depth (safety overlap) to the SMMs. In this configuration, a boron dilution event (BDE) cannot occur. This is the basis for not having to analyze for BDE in Mode 6. Since the BDE cannot occur with the dilution flow paths isolated, the SMMs are not required to be operable as the event cannot occur and operable SMMs provide no benefit.

3. Increase the shutdown margin surveillance frequency from every 24 hours to every 12 hours. This action in combination with the above, provide defense in depth and overlap to the loss of the SMMs.

Surveillance Requirements

The SMMs are subject to an ACOT every 92 days to ensure each train of SMM is fully operational. This test shall include verification that the SMMs are set per the Core Operating Limit Report.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 164

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 May 9, 1997, as supplemented August 4, 1998, the Northeast Nuclear Energy Company, et al. (the licensee), submitted a request for changes to the Millstone Nuclear Power Station, Unit No. 3 Technical Specifications (TS). The requested changes would revise the shutdown margin requirements and add TS 3/4.3.5 to provide the limiting condition for operation (LCO) and surveillance requirements for the shutdown margin monitors (SMMs). The amendment would also make administrative changes and revise the associated Bases section. The August 4, 1998, letter provided clarifying information that did not change the initial proposed no significant hazards consideration determination.

2.0 BACKGROUND

The basic function of the SMM is to measure the neutron flux during reactor shutdown conditions. The purpose of the SMM is to identify any statistically significant increase in count rate that would indicate a loss of reactor shutdown margin. The Final Safety Analysis Report (FSAR), Chapter 15, boron dilution event analysis is performed to define minimum shutdown margin requirements. These shutdown margin requirements ensure that minimum time requirements are met for the time from alarm/indication to loss of shutdown margin. The alarm setpoint is selected to provide the operator with sufficient time to stop an unplanned loss of shutdown margin. The licensee's current boron dilution event analysis credits the alarm function for Modes 3, 4, and 5.

The SMM continuously monitors the neutron count rate and multiplies the count rate by the alarm ratio in order to determine the alarm set point. The alarm ratio is determined by the position of a switch on the SMM. The alarm set point is in turn determined (updated) so that the lowest previous value is used for monitoring purposes.

License Amendment No. 60, dated March 11, 1991, placed requirements for the SMMs in the TS. In the associated safety evaluation (SE), the NRC staff stated in item (6) that the shutdown margin for Modes 3, 4, and 5 have been added and show the shutdown margin as a

function of critical boron concentration. For these shutdown modes, boron dilution analyses were performed to define the minimum shutdown margin requirements. Results of the analyses showed that the minimum time intervals available to the operator before a loss of shutdown margin occurs met those required by Standard Review Plan (SRP) Section 15.4.6. As required by the SRP, the minimum time intervals were calculated from the time an alarm alerts the operator to a dilution, not from the time the dilution begins. The SMMs, which provided the alarm, were discussed in item (27) of the SE.

In item (27) of the SE, the staff stated that for cycle 4, two SMMs, one per train, were added to the design. These monitors measure the count rate obtained from the GAMMA-METRICS wide range neutron-flux monitoring system and provide an alarm when the count rate increases by an amount equal to the alarm ratio set into the monitors. These monitors provide an alarm only and will not perform a protective function such as a reactor trip. These monitors serve to meet the requirements of SRP 15.4.6 for redundant alarms to alert the operator of any unplanned boron dilution event and were credited in the cycle 4 boron dilution safety analyses during shutdown conditions. The alarm setpoint of 2.0 corresponds to a doubling of the neutron flux and a 10-second delay for alarm response was assumed. Based on these considerations, and on the addition of a quarterly surveillance requirement in Table 4.3-1 to verify the correct alarm setting for the SMM, the proposed changes were found to be acceptable.

In a license amendment request dated June 3, 1996, the licensee identified that the count rate seen by the SMMs was declining due to an extended outage and that at a certain value the SMMs would have to be declared inoperable. Therefore, the licensee proposed changes to the TS to allow the plant to change operational modes with the SMMs inoperable, while continuing to comply with the LCO action statements. In the SE associated with License Amendment No. 131, dated November 14, 1996, the staff stated that these action statements must be performed to ensure safety and are stated below:

(a) All positive reactivity operations via dilution and rod withdrawal must be suspended.

This action statement is intended to stop any planned dilution of the reactor coolant system. Typically, the SMMs play no role in monitoring core reactivity during plant heatup, and the alarm setpoint is routinely reset during plant heatup due to the increasing count rate. On the other hand, during plant cooldowns, as the count rate decreases, the baseline count rate is continually lowered automatically by the SMMs.

(b) All dilution flow paths must be isolated and placed under administrative control (locked closed). Also, the shutdown margin surveillance frequency must be increased from 24 hours to every 12 hours.

This action is intended to provide redundant protection and defense in depth to the SMMs. In this configuration, a boron dilution event is prevented and is the basis for not requiring a boron dilution event analysis in Mode 6. Since the occurrence of a boron dilution event is prevented, the SMMs are not required to be operable.

Based on the staff's review, the proposed change to allow Millstone Unit 3 to change modes with inoperable SMMs was found to be acceptable.

3.0 EVALUATION

The proposed TS consists of a reanalyses of the boron dilution event, which was recently performed by Westinghouse. The reanalyses assumed additional SMM time delays (and, therefore, lower initial count rates), which were greater than those assumed in the current analysis of record for the Mode 3, 4, and 5 conditions. The licensee picked a delay time and a count rate that was equivalent to about 3-4 months after shutdown as the input variables for the reanalyses. The reanalyses, with increased SMM delay times, result in revised shutdown margin/boration requirements, which are more limiting than the current requirements; however, they provide operating margin in allowing the SMM to be considered operable at lower initial count rates. The use of the revised shutdown margin requirements and the lower allowed count rate continue to assure that the operator will have at least 15 minutes to mitigate the consequences of a boron dilution event. The reanalyses resulted in new (more restrictive) curves for Modes 3, 4, and 5 (Figures 3.1-1, 3.1-2, 3.1-3, 3.1-4, 3.1-5) of shutdown margin vs. reactor coolant system critical boron concentration.

In addition, a second reanalysis was conducted by Westinghouse with SMM delay times, which are more conservative than that used in the reanalysis previously stated. The results of these reanalyses were used to develop the necessary additional boration values, which will be included in Specification 3/4.3.5. This specification directs the boration of the reactor coolant system above the shutdown margin requirements in Figures 3.1-1 to 3.1-5 in order to allow for the SMM to be considered operable for count rates that are lower than allowed by implementation of only the Figures 3.1-1 to 3.1-5 requirements. The additional boration values included in TS 3/4.3.5 are 150 parts per million (ppm) for Mode 3 (to be added to Figures 3.1-1 and 3.1-2), and 350 ppm for Modes 4 and 5 (to be added to Figures 3.1-3, 3.1-4, and 3.1-5). This accounts for the case where a shutdown (or outage) would last longer than the 3-4 months and allows the SMM to be operable at a lower count rate.

The minimum count rate and associated SMM alarm ratio settings will be included in the core operating limit report (COLR). If the count rate went below the applicable minimums, the SMM would have to be declared inoperable. If future changes to the minimum count rate and associated SMM alarm ratio settings as described in the COLR were made, the licensee would have to inform the NRC staff of the change. The proposed changes will continue to assure that the operator has a minimum of 15 minutes from the alarm to loss of shutdown margin during an assumed boron dilution event and also allow the SMM to be considered operable for lower initial count rates.

3.1 Technical Specification Changes

TS 3.1.1.1.2 and 3.1.1.2

The licensee proposed to add a footnote in TS 3.1.1.1.2 and 3.1.1.2 to note that additional shutdown margin requirements are given in newly created TS 3/4.3.5. The staff finds the addition of the footnote acceptable.

TS Figures 3.1-1 to 3.1-5

The licensee proposed revised curves based on the reanalyses of the boron dilution event for Modes 3, 4, and 5. The revised shutdown margin/boration requirements are more limiting than the current requirements and they provide operating margin in allowing the SMM to be considered operable at lower initial count rates. The staff finds the revised curves conservative and acceptable.

TS Tables 3.3-1 and 4.3-1

The licensee proposed to delete the references to the SMMs in TS Tables 3.3-1 and 4.3-1. The requirements for the SMMs are provided in the newly created TS 3/4.3.5 (see below). Therefore, the staff finds the changes acceptable.

TS 3/4.3.5

Proposed TS 3/4.3.5 would contain all the LCOs, applicability, action requirements, and all the surveillance requirements for the SMMs. The LCO refers to the COLR in order to specify the minimum count rate/alarm ratio requirements for SMM operability. These requirements are a function of the shutdown margin, which is established (requirements of Figures 3.1-1 to 3.1-5 or additional boration as discussed previously and contained in TS 3.3.5.b). The proposed TS includes the actions and surveillance requirements that are based on the current requirements listed in TS Tables 3.3-1 and 4.3-1. The proposed TS also includes a footnote to make the specification treatment of the valves consistent with the Mode 6 and Mode 5 loops drained requirements. The staff finds the proposed changes acceptable in that the TS will continue to assure that the SMMs are operable and that the operator has a minimum of 15 minutes from the alarm to loss of shutdown margin during an assumed boron dilution event to stop the event Pursuant to SRP 15.4.6.

TS Bases

The staff has reviewed the changes to the associated TS Bases sections and has no objection to the wording.

3.2 Licensee Commitments Relied Upon

The boron dilution event analysis is documented in FSAR Chapter 15.4.6. The proposed TS changes are based on the Westinghouse reanalysis of the boron dilution event. As such, the reanalysis will be become the "analysis of record" for the boron dilution event in Modes 3, 4, and 5. In a letter dated August 4, 1998, the licensee committed that (1) Millstone Unit 3 will incorporate into TS 6.9.1.6 references to the shutdown margin analysis methods reviewed and approved by the NRC; and (2) the proposed change to TS 6.9.1.6 will be submitted to the NRC within 90 days of the NRC's decision on the proposed license amendment dated May 9, 1997. The NRC staff finds this commitment and schedule acceptable and has placed it in Appendix C of the Millstone Unit 3 Facility Operating License. The licensee must notify the staff, in writing, when the condition in Appendix C is satisfied.

3.3 Overall

The NRC staff has reviewed the information submitted by the licensee and, based on the preceding evaluation, has concluded that the requested TS changes are acceptable, and satisfy the staff's positions and requirements in these areas.

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 (62 FR 33129 dated June 18, 1997). 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: A. Attard

Date: October 21, 1998