ENCLOSURE

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of)	Docket No. 50-275
)	Facility Operating License
PACIFIC GAS AND ELECTRIC COMPANY)	No. DPR-80
)	
Diablo Canyon Power Plant)	Docket No. 50-323
Units 1 and 2)	Facility Operating License
)	No. DPR-82
	License Amendment Request
	No. 89-08

Pursuant to 10 CFR 50.90, Pacific Gas and Electric Company (PG&E) hereby applies to amend its Diablo Canyon Power Plant (DCPP) Facility Operating License Nos. DPR-80 and DPR-82 (Licenses).

The proposed changes amend the Technical Specifications (Appendix A of the Licenses) as regards to Technical Specifications 3.1.1.1, 3.1.1.2, 4.1.2.1, 4.1.2.2, 3.1.2.5, 3.1.2.6, 3.5.5, 3.9.1, 3.10.1, and Associated Bases associated with the boron concentration in the Boric Acid System. Information on the proposed changes is provided in Attachments A and B.

These changes have been reviewed and are considered not to involve a significant hazards consideration as defined in 10 CFR 50.92 or require an environmental assessment in accordance with 10 CFR 51.22(b). Further, there is reasonable assurance that the health and safety of the public will not be endangered by the proposed changes.

Subscribed in San Francisco, California, this 5th day of July 1989.

Respectfully submitted,

Pacific Gas and Electric Company

By _____
J. D. Shiffer
Vice President
Nuclear Power Generation

Howard V. Golub
Richard F. Locke
Attorneys for Pacific
Gas and Electric Company

By _____
Richard F. Locke

Subscribed and sworn to before me
this 5th day of July 1989.

_____
Adriane D. Tolefree, Notary Public
for the County of Alameda,
State of California

OFFICIAL SEAL
ADRIANE D. TOLEFREE
NOTARY PUBLIC - CALIFORNIA
ALAMEDA COUNTY
My Comm. Expires Dec. 22, 1992

My commission expires December 22, 1992.

2773S/0069K

Pacific Gas and Electric Company

77 Beale Street
San Francisco, CA 94106
415/972-7000
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James D. Shiffer
Vice President
Nuclear Power Generation

July 5, 1989

PG&E Letter No. DCL-89-182

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Re: Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2
License Amendment Request 89-08
Revision of Technical Specifications 3.1.1.1, 3.1.1.2, 4.1.2.1, 4.1.2.2, 3.1.2.5, 3.1.2.6, 3.5.5, 3.9.1, 3.10.1, and Associated Bases - Reduce Boron Concentration in the Boric Acid System

Gentlemen:

Enclosed is an application for amendment to Facility Operating License Nos. DPR-80 and DPR-82. The enclosed License Amendment Request (LAR) proposes to revise the Technical Specifications associated with the Boric Acid System to reduce the boron concentration from 12 to 4 weight percent.

As discussed in Generic Letter 85-16, there have been incidents at operating plants in which boric acid crystallization in safety-related system components has been sufficient to render the systems inoperable. The changes proposed in this LAR will reduce the potential for such incidents at Diablo Canyon and reduce routine maintenance and operations problems associated with the boric acid storage and transfer systems. Based on the potential safety risk associated with use of high concentration boric acid, PG&E believes the priority for NRC review and approval of this LAR is high and desires timely issuance of the requested license amendment.

PG&E presently plans to implement the required plant modifications and reduce the boron concentration in the Boric Acid System during the Unit 2 third refueling outage (February 1990) and the Unit 1 fourth refueling outage (February 1991). To include the proposed changes in the 1990 Unit 2 outage, PG&E needs to have a license amendment issued approving the requested changes prior to December 1, 1989. To provide flexibility for implementation of the technical specification revisions, PG&E suggests that the NRC make the revised technical specifications effective for each unit "following the refueling outage in which the modifications are implemented." PG&E will inform the NRC before restart of each unit

A001
1/1

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following implementation of the plant modifications and boron concentration reduction.

Kindly acknowledge receipt of this material on the enclosed copy of this letter and return it in the enclosed addressed envelope.

Sincerely,

J. D. Shiffer

cc: J. B. Martin
M. M. Mendonca
P. P. Narbut
H. Rood
P. A. Szalinski
B. H. Vogler
CPUC
Diablo Distribution

Enclosure

2773S/0069K/RLJ/2252

ENCLOSURE

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of PACIFIC GAS AND ELECTRIC COMPANY Diablo Canyon Power Plant Units 1 and 2	Docket No. 50-275 Facility Operating License No. DPR-80 Docket No. 50-323 Facility Operating License No. DPR-82 License Amendment Request No. 89-08

Pursuant to 10 CFR 50.90, Pacific Gas and Electric Company (PG&E) hereby applies to amend its Diablo Canyon Power Plant (DCPP) Facility Operating License Nos. DPR-80 and DPR-82 (Licenses).

The proposed changes amend the Technical Specifications (Appendix A of the Licenses) as regards to Technical Specifications 3.1.1.1, 3.1.1.2, 4.1.2.1, 4.1.2.2, 3.1.2.5, 3.1.2.6, 3.5.5, 3.9.1, 3.10.1, and Associated Bases associated with the boron concentration in the Boric Acid System. Information on the proposed changes is provided in Attachments A and B.

These changes have been reviewed and are considered not to involve a significant hazards consideration as defined in 10 CFR 50.92 or require an environmental assessment in accordance with 10 CFR 51.22(b). Further, there is reasonable assurance that the health and safety of the public will not be endangered by the proposed changes.

Subscribed in San Francisco, California, this 5th day of July 1989.

Respectfully submitted,

Pacific Gas and Electric Company

By _____
J. D. Shiffer
Vice President
Nuclear Power Generation

Howard V. Golub
Richard F. Locke
Attorneys for Pacific
Gas and Electric Company

By _____
Richard F. Locke

Subscribed and sworn to before me
this 5th day of July 1989.

_____
Adriane D. Tolefree, Notary Public
for the County of Alameda,
State of California

OFFICIAL SEAL
ADRIANE D. TOLEFREE
NOTARY PUBLIC - CALIFORNIA
ALAMEDA COUNTY
My Comm. Expires Dec. 22, 1992

My commission expires December 22, 1992.

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ATTACHMENT A

REVISION OF TECHNICAL SPECIFICATIONS 3.1.1.1, 3.1.1.2, 4.1.2.1, 4.1.2.2, 3.1.2.5, 3.1.2.6, 3.5.5, 3.9.1, 3.10.1, AND ASSOCIATED BASES

A. DESCRIPTION OF AMENDMENT REQUEST

This license amendment request (LAR) proposes to revise technical specifications associated with the boric acid system boron concentration. This LAR will allow a change of the boron concentration in the boric acid system from 12 to 4 weight percent. To implement this change the following modifications to the Technical Specifications (TS) are required:

- TS 3.1.1.1, "Shutdown Margin - Tavg Greater than 200°F": Due to a decrease in boric acid concentration from 12 weight percent (20,000 ppm) to 4 weight percent (7,000 ppm) the borated water flowrate will be increased from 10 gallons per minute (gpm) to 30 gpm.

- TS 3.1.1.2, "Shutdown Margin - Tavg Less Than or Equal to 200°F": As in Technical Specification 3.1.1.1, boron concentration will be decreased from 20,000 ppm to 7,000 ppm and borated water flowrate increased from 10 to 30 gpm.

- TS 4.1.2.1, "Flow Path - Shutdown": The surveillance requirement for verification of the temperature of the heat tracing will be changed from 145°F to 65°F and the reference to heat traced portions of the flow path will be deleted.

- TS 4.1.2.2, "Flow Path - Operating": The same revisions as in TS 4.1.2.1 will be made. Also, TS 4.1.2.2d, which verifies every 18 months that the flow path to the RCS delivers a flowrate of 10 gpm, will be changed to 30 gpm.

- TS 3.1.2.5, "Borated Water Source - Shutdown": Since the boron concentration will be decreased from 20,000 to 7,000 ppm, the minimum usable borated water volume will be increased from 835 to 2499 gallons. Also, the minimum solution temperature will be changed from 145°F to 65°F, the reference to a heat tracing channel will be deleted, the reference to a minimum boron concentration of 2,000 ppm for Unit 1 Cycle 2 will be deleted, and the cycle dependent notes will be deleted.

- TS 3.1.2.6, "Borated Water Source - Operating": Since the boron concentration will be decreased from 20,000 to 7,000 ppm, the minimum usable borated water volume will be increased from 5,106 to 14,042 gallons. Also, the minimum solution temperature will be changed from 145°F to 65°F, the reference to a heat tracing

channel will be deleted, the reference to a boron concentration between 2,000 and 2,200 ppm for Unit 1 Cycle 2 will be deleted, and the cycle dependent notes will be deleted.

- TS 3.5.5, "Refueling Water Storage Tank": This specification will be revised to reflect that a boron concentration of between 2300 ppm and 2500 ppm is being utilized in Units 1 and 2 and the cycle dependent notes will be deleted.

- TS 3.9.1, "Refueling Operations - Boron Concentration": The action statement will be revised to reflect the change to 7,000 ppm boric acid solution and the increased boric acid flowrate to 30 gpm.

- TS 3.10.1, "Special Test Exceptions - Shutdown": The action statement will be revised to reflect the change to 7,000 ppm boric acid solution and the increased boric acid flowrate to 30 gpm.

- TS Bases 3/4.1.2, "Boration Systems": The second paragraph currently states that, "The maximum expected boration capability requirement occurs at EOL from full power equilibrium xenon conditions." This will be replaced by "The maximum expected boration capability occurs at BOL when borating from hot zero percent power to cold shutdown ...." The minimum usable borated water volume of 5,106 gallons will be increased to 14,042 gallons and the boron concentration of 20,000 ppm will be decreased to 7,000 ppm. Also, the reference in the Bases specifying the volume of borated water in the refueling water storage tank (RWST) needed to provide adequate shutdown margin will be changed from 75,000 gallons to 65,784 gallons. The above changes affect Modes 1 to 4.

  The requirements for borated water for Modes 5 and 6 are also affected. The boric acid tank (BAT) required volume will change from 835 gallons of 20,000 ppm borated water to 2,499 gallons of 7,000 ppm borated water. The reference in the Bases specifying the water volume in the RWST needed to provide adequate shutdown margin will be increased from 9,690 to 17,865 gallons. Also, the reference to having heat tracing as a requirement for operability of the system is proposed to be deleted.

Proposed changes to the Technical Specifications of Operating License Nos. DPR-80 and DPR-82 are noted in the marked-up copy of the applicable Technical Specifications (Attachment B).

B. BACKGROUND

1. Design Basis

The Diablo Canyon Power Plant (DCPP) uses two Boric Acid Tanks (BATs) for each unit, presently containing 12 weight percent

boric acid. The BATs are the primary source of boron within the Chemical and Volume Control System (CVCS) and are used to change the Reactor Coolant System (RCS) RCS boron concentration or to provide RCS makeup water at the prevailing boron concentration. The boric acid transfer pumps draw concentrated boric acid from the BAT. The concentrated boric acid may be blended with primary water to a pre-selected blend and delivered directly to the volume control tank and/or to the suction of the charging pumps.

Westinghouse designs, since the Farley Nuclear Plant, use 4 weight percent boron concentration in the BATs. While the current Westinghouse design uses 4 weight percent, the historical design basis for earlier Westinghouse plants such as Diablo Canyon had been for the combined capacity of the two tanks to contain sufficient 12 weight percent boric acid solution to, without makeup to the BATs, borate the plant to a refueling concentration at the end of life, and following a return to full power, to borate to a cold shutdown concentration. The basis for this design was operational and not associated with mitigation of any design basis accidents.

The historical design basis has been reevaluated and determined to be overly restrictive. The required constraints have been determined to be:

a. As a minimum, the BATs must maintain adequate boric acid solution volume and concentration to borate the RCS (and CVCS) to a cold shutdown concentration at any time during the core cycle and with a shutdown margin consistent with the Technical Specifications. This requirement is reflected in the changes proposed to Technical Specifications 3.1.2.5 and 3.1.2.6 requiring an increase in available boron volumes for various modes.

b. Boric acid fluid temperatures must be maintained above the solubility limit throughout the acceptable concentration range. This requirement is reflected in the changes made to the Technical Specifications that require minimum tank and piping temperatures.

c. Sufficient volumetric margins must be provided to account for level instrument accuracy, avoid vortex formation within the tank outlet, and provide adequate boric acid transfer pump net positive suction head.

2. Boric Acid System Modifications

The following system modifications will be made to allow for the reduced boron concentration in the BAT and to meet the constraints discussed above:

a. The two presently installed BATs at DCPP have a nominal storage capacity of 8,000 gallons each (16,000 gallons total). To ensure that the proposed Technical Specification requirement of 14,042 gallons of 4 weight percent boric acid solution is always available in Modes 1 through 4, PG&E will install additional tankage to support plant operations. This additional tankage will consist of two auxiliary tanks common to both Units 1 and 2 with approximately a 2,600 gallon capacity each. This will allow at least one tank to always be available to rapidly fill the BATs while batching, recirculation, filling, or chemistry analyses are being performed on the auxiliary tank not lined up to fill the BATs. These tanks will not be seismically qualified or designed as safety related tankage. They are provided for operational convenience in order to have a ready supply of boric acid to refill the BATs. These additional tanks will be installed at the earliest possible time, but not later than the Unit 1 fourth refueling outage.

b. The internals of valves in the borated water flow path will be replaced with larger internals to allow an increase in borated water flowrate from the present 10 gpm to 30 gpm.

c. The range on the boric acid flow transmitter and flow indicator will be increased to correspond to the new borated water flowrate.

d. The low level alarm settings at each BAT will be modified to satisfy the new Technical Specification requirement of 7,021 gallons for each BAT.

e. The settings of the heat-tracing controllers will be modified to conform to the 4 weight percent boric acid concentration.

f. The settings of each BAT heater temperature controller will be modified to conform to the 4 weight percent boric acid concentration.

C. JUSTIFICATION

Historically, the boric acid transfer pumps, associated heat tracing equipment, and the level instrumentation on the BAT have created maintenance and operations problems not only at DCPP but also at other operating power plants. Precipitation in the BIT/BAT recirculation line may cause malfunctions of safety injection flow paths, as discussed in Generic Letter 85-16. In addition, valve stem leakoffs for 12 weight percent boric acid systems are a source of continuous cleanup and maintenance. These maintenance items are costly in terms of personnel time and, more importantly, personnel radiation exposure.

The requirement for heat tracing as a condition for operability of the boric acid injection system and boric acid storage system is proposed to be deleted. PG&E intends to maintain the heat tracing system as

presently installed with its associated redundancy and alarm capability. The BATs have temperature indication on the main control board and are also alarmed. The solubility limit of 4 weight percent boric acid (4.4 weight percent boric acid precipitates at 65°F) is much closer to normal room temperature than the 12 weight percent boric acid currently in use. This means the fluid temperature will approach its solubility limit much slower and allow sufficient time for operator intervention. The alarm capability of the boric acid system will advise operators if the temperature is outside the prescribed range. Compensatory measures could be taken, if necessary, if the fluid temperature approaches 65°F. Declaring a 4 weight percent boric acid system inoperable based on the loss of heat tracing is an unnecessary. operating restriction since the room temperature could be greater than 65°F (e.g. summertime). The operability requirement can be based on temperature as has been previously licensed on the Wolf Creek Nuclear Power Plant.

A license amendment for a similar change was also issued by the NRC for the Waterford Unit 3 Nuclear Power Plant. There are also many operating Westinghouse nuclear power plants that were originally licensed with 4 weight percent boric acid.

D. SAFETY EVALUATION

Utilizing nominal 4 weight percent boric acid, Westinghouse has determined that 14,042 gallons of borated water is an adequate reserve to provide proper shutdown margin for modes 1, 2, 3, and 4 and 2,499 gallons is adequate for modes 5 and 6 for the present 18 month core cycle. Neither of these values are assumed as the basis for any analyzed accident.

The volume requirement of 14,042 gallons assumes an initial RCS boron concentration of 1,449 ppm at hot full power at the beginning of core life (BOL). The reactor is then shut down using rods to hot zero percent power. With rods still inserted, boron concentration is diluted to follow the xenon transient and facilitate a quick return to hot zero power upon the withdrawal of the rods. Margin is included such that the dilution results in a boron concentration which permits a return to criticality without the rods being completely withdrawn. This margin corresponds to the rod insertion limit. At this point, the boron concentration (1,097 ppm) is less than before the shutdown. It is now assumed that the plant must go to cold shutdown boron concentration (1,695 ppm and 200°F).

Westinghouse has also recalculated the RWST volume that is required to provide adequate shutdown margin (65,784 gallons of 2,300 ppm borated water for Modes 1, 2, 3, and 4 and 17,865 gallons of 2,300 ppm borated water for Modes 5 and 6). The same basis described above for the BAT volumes of 14,042 gallons for modes 1, 2, 3, and 4 and 2,499 gallons for modes 5 and 6, applies for the RWST volumes. However, no Technical Specification revisions are required because the present required volumes specified in LCO 3.1.2.5.b.1 (50,000 gallons) and 3.1.2.6.b.1 (400,000 gallons) bound these changes.

Based upon the information provided above, PG&E believes that there is reasonable assurance that the health and safety of the public will not be adversely affected by changing the boric acid concentration from 12 to 4 weight percent.

E. NO SIGNIFICANT HAZARDS EVALUATION

PG&E has evaluated the no significant hazard considerations involved with the proposed amendment, focusing on the three standards set forth in 10 CFR 50.92(c) as quoted below:

The Commission may make a final determination, pursuant to the procedures in paragraph 50.91, that a proposed amendment to an operating license for a facility licensed under paragraph 50.21(b) or paragraph 50.22 or a testing facility involves no significant hazards considerations, if operation of the facility in accordance with the proposed amendment would not:

(1) Involve a significant increase in the probability or consequences of an accident previously evaluated; or

(2) Create the possibility of a new or different kind of accident from any accident previously evaluated; or

(3) Involve a significant reduction in a margin of safety.

The following evaluation is provided for the no significant hazards consideration standards.

1. Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?

   The BAT borated water is not assumed for mitigation of any of the design basis accidents or transients in the FSAR Update. The RWST, however, supplies borated water to mitigate accidents such as, Minor Secondary System Pipe Breaks (FSAR Update Section 15.3.2), and, "Rupture of a Main Steam Line (FSAR Section 15.4.2.1)." The new RWST volumes specified in the Bases section of the Technical Specification for the BAT and RWST are bounded by the current volumes specified in the Technical Specifications.

   Therefore, this change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?

   Precipitation in the BIT/BAT recirculation line may cause malfunctions of safety injection flow paths, as discussed in

Generic Letter 85-16. Reducing the boric acid concentration from 12 weight percent to 4 weight percent will reduce the probability of precipitation of boric acid in the Emergency Core Cooling flow path. Furthermore, the removal of heat tracing from the technical specifications will have no adverse affect because the fluid temperature will still be required to be maintained above the solubility limit.

Therefore, this change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does the change involve a significant reduction in a margin of safety?

The Basis Section, 3/4.1.2, "Boration System," states that the boron injection system ensures that negative reactivity control is available during each mode of facility operation to provide a sufficient boron water source to provide a shutdown margin from expected operating conditions of 1.6% delta k/k after xenon decay and cooldown to 200 degrees and a shutdown margin of 1% delta k/k after xenon decay and cooldown from 200 to 140 degrees. The new BAT volumes of 14,042 gallons of 4 percent boron for Modes 1, 2, 3, and 4 and 2,499 gallons of 4 weight percent boron for Modes 5 and 6 still meet this requirement.

Therefore, this change does not involve a significant reduction in a margin of safety.

F. NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

Based on the above safety evaluation, PG&E concludes that the activities associated with this LAR satisfy the no significant hazards consideration standards of 10 CFR 50.92(c) and, accordingly, a no significant hazards consideration finding is justified.

G. ENVIRONMENTAL EVALUATION

PG&E has evaluated the proposed changes and determined that the changes do not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed changes meet the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), an environmental assessment of the proposed changes is not required.

ATTACHMENT B

MARKED-UP TECHNICAL SPECIFICATIONS

Remove	Insert
3/4 1-1	3/4 1-1
3/4 1-3	3/4 1-3
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 1-12	3/4 1-12
3/4 1-13	3/4 1-13
3/4 5-11	3/4 5-11
3/4 9-1	3/4 9-1
3/4 10-1	3/4 10-1
B 3/4 1-2	B 3/4 1-2

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3/4.1 REACTIVITY CONTROL SYSTEMS

3/4.1.1 BORATION CONTROL

SHUTDOWN MARGIN - T_{avg} GREATER THAN 200°F

LIMITING CONDITION FOR OPERATION

3.1.1.1 The SHUTDOWN MARGIN shall be greater than or equal to 1.6% Δk/k.

APPLICABILITY: MODES 1, 2*, 3, and 4.

ACTION:

With the SHUTDOWN MARGIN less than 1.6% Δk/k, immediately initiate and continue boration at greater than or equal to ~~10~~ 30 gpm of a solution containing greater than or equal to ~~20,000~~ 7,000 ppm boron or equivalent until the required SHUTDOWN MARGIN is restored.

SURVEILLANCE REQUIREMENTS

4.1.1.1.1 The SHUTDOWN MARGIN shall be determined to be greater than or equal to 1.6% Δk/k:

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);

b. When in MODES 1 or 2 with K_{eff} greater than or equal to 1, at least once per 12 hours by verifying that control bank withdrawal is within the limits of Specification 3.1.3.6;

c. When in MODE 2 with K_{eff} less than 1, within 4 hours prior to achieving reactor criticality by verifying that the predicted critical control rod position is within the limits of Specification 3.1.3.6;

d. Prior to initial operation above 5% RATED THERMAL POWER after each fuel loading, by consideration of the factors of Specification 4.1.1.1.1e., below, with the control banks at the maximum insertion limit of Specification 3.1.3.6; and

*See Special Test Exceptions Specification 3.10.1.

SHUTDOWN MARGIN - T_{avg} LESS THAN OR EQUAL TO 200°F

LIMITING CONDITION FOR OPERATION

3.1.1.2 The SHUTDOWN MARGIN shall be greater than or equal to 1% Δk/k.

APPLICABILITY: MODE 5.

ACTION:

With the SHUTDOWN MARGIN less than 1% Δk/k, immediately initiate and continue boration at greater than or equal to ~~10~~ 30 gpm of a solution containing greater than or equal to ~~20,000~~ 7,000 ppm boron or equivalent until the required SHUTDOWN MARGIN is restored.

SURVEILLANCE REQUIREMENTS

4.1.1.2 The SHUTDOWN MARGIN shall be determined to be greater than or equal to 1% Δk/k:

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.

3/4.1.2 BORATION SYSTEMS

FLOW PATH - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.1.2.1 As a minimum, one of the following boron injection flow paths shall be OPERABLE with motor-operated valves required to change position and pumps required to operate for boron injection capable of being powered from an OPERABLE emergency power source:

a. A flow path from the boric acid tanks via a boric acid transfer pump and charging pump to the Reactor Coolant System if the boric acid storage tank in Specification 3.1.2.5a. is OPERABLE, or

b. The flow path from the refueling water storage tank via a charging pump to the Reactor Coolant System if the refueling water storage tank in Specification 3.1.2.5b. is OPERABLE.

APPLICABILITY: MODES 5 and 6.

ACTION:

With none of the above flow paths OPERABLE or capable of being powered from an OPERABLE emergency power source, suspend all operations involving CORE ALTERATIONS or positive reactivity changes.

SURVEILLANCE REQUIREMENTS

4.1.2.1 At least one of the above required flow paths shall be demonstrated OPERABLE:

a. At least once per 7 days by verifying that the temperature of the ~~heat traced portion of the~~ flow path is greater than or equal to 65 ~~145~~°F when a flow path from the boric acid tanks is used, and

b. At least once per 31 days by verifying that each valve (manual, power-operated or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position.

FLOW PATHS - OPERATING

LIMITING CONDITION FOR OPERATION

3.1.2.2 Each of the following boron injection flow paths shall be OPERABLE:

a. The flow path from the boric acid tanks via a boric acid transfer pump and a charging pump to the Reactor Coolant System (RCS), and

b. The flow path from the refueling water storage tank via a charging pump to the RCS.

APPLICABILITY: MODES 1, 2, 3 and 4#.

ACTION:

a. With the flow path from the boric acid tanks inoperable, restore the inoperable flow path to OPERABLE status within 72 hours or be in at least HOT STANDBY and borated to a SHUTDOWN MARGIN equivalent to at least 1% $\Delta k/k$ at 200°F within the next 6 hours; restore the flow path to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.

b. With the flow path from the refueling water storage tank inoperable, restore the flow path to OPERABLE status within 1 hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.1.2.2 Each of the above required flow paths shall be demonstrated OPERABLE:

a. At least once per 7 days by verifying that the temperature of the ~~heat traced portion of the~~ flow path from the boric acid tanks is greater than or equal to ~~145°~~F,

b. At least once per 31 days by verifying that each valve (manual, power-operated or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position,

c. At least once per 18 months by verifying that each automatic valve in the flow path actuates to its correct position on a safety injection test signal, and

#Only one boron injection flow path is required to be OPERABLE whenever the temperature of one or more of the RCS cold legs is less than or equal to 323°F.

SURVEILLANCE REQUIREMENTS (Continued)

d. At least once per 18 months by verifying that the flow path required by Specification 3.1.2.2a. delivers at least ~~10~~ 30 gpm to the RCS.

REACTIVITY CONTROL SYSTEMS

BORATED WATER SOURCE - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.1.2.5 As a minimum, one of the following borated water sources shall be OPERABLE:

a. A Boric Acid Storage System ~~and at least one associated heat tracing channel~~ with:

   1) A minimum contained borated water volume of ~~835~~ 2499 gallons,

   2) A boron concentration between ~~20,000~~ 7000 and ~~22,500~~ 7700 ppm, and

   3) A minimum solution temperature of ~~145~~ 65°F.

b. The Refueling Water Storage Tank (RWST) with:

   1) A minimum contained borated water volume of 50,000 gallons,

   2) ~~A minimum boron concentration of 2000 ppm (Unit 1 Cycle 2),~~ A minimum boron concentration of 2300 ppm ~~(Unit 1 Cycle 3 and after, Unit 2)~~, and

   3) A minimum solution temperature of 35°F.

APPLICABILITY: MODES 5 and 6.

ACTION:

With no borated water source OPERABLE, suspend all operations involving CORE ALTERATIONS or positive reactivity changes.

SURVEILLANCE REQUIREMENTS

4.1.2.5 The above required borated water source shall be demonstrated OPERABLE:

a. At least once per 7 days by:

   1) Verifying the boron concentration of the water,

   2) Verifying the contained borated water volume, and

   3) Verifying the boric acid storage tank solution temperature when it is the source of borated water.

b. At least once per 24 hours by verifying the RWST temperature when it is the source of borated water and the outside ambient air temperature is less than 35°F.

LIMITING CONDITION FOR OPERATION

3.1.2.6 Each of the following borated water source(s) shall be OPERABLE:

a. A Boric Acid Storage System ~~and at least one associated heat tracing channel~~ with:

1) A minimum contained borated water volume of ~~5106~~ 14,042 gallons,

2) A boron concentration between ~~20,000~~ 7,000 and ~~22,500~~ 7,700 ppm, and

3) A minimum solution temperature of ~~145~~ 65°F.

b. The Refueling Water Storage Tank (RWST) with:

1) A contained borated water volume of greater than or equal to 400,000 gallons,

2) ~~A boron concentration between 2000 and 2200 ppm (Unit 1 Cycle 2)~~, A boron concentration between 2300 and 2500 ppm, ~~(Unit 1 Cycle 3 and after, Unit 2)~~, and

3) A minimum solution temperature of 35°F.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With the Boric Acid Storage System inoperable, restore the system to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and borated to a SHUTDOWN MARGIN equivalent to at least 1% $\Delta k/k$ at 200°F; restore the Boric Acid Storage System to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.

b. With the RWST inoperable, restore the tank to OPERABLE status within 1 hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

3/4.5.5 REFUELING WATER STORAGE TANK

LIMITING CONDITION FOR OPERATION

3.5.5 The Refueling Water Storage Tank (RWST) shall be OPERABLE with:

a. A minimum contained borated water volume of 400,000 gallons,

b. ~~A boron concentration of between 2000 and 2200 ppm (Unit 1 Cycle 2),~~ A boron concentration of between 2300 and 2500 ppm ~~(Unit 1 Cycle 3 and after, Unit 2)~~, and

c. A minimum solution temperature of 35°F.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

With the RWST inoperable, restore the tank to OPERABLE status within 1 hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.5.5 The RWST shall be demonstrated OPERABLE:

a. At least once per 7 days by:

1) Verifying the contained borated water volume in the tank, and

2) Verifying the boron concentration of the water.

b. At least once per 24 hours by verifying the RWST temperature when the outside ambient air temperature is less than 35°F.

3/4.9 REFUELING OPERATIONS

3/4.9.1 BORON CONCENTRATION

LIMITING CONDITION FOR OPERATION

3.9.1 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, which includes a 1% $\Delta k/k$ conservative allowance for uncertainties, or

b. A boron concentration of greater than or equal to 2000 ppm, which includes a 50 ppm conservative allowance for uncertainties.

APPLICABILITY: MODE 6*.

ACTION:

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 ~~10~~ 30 gpm of a solution containing greater than or equal to ~~20,000~~ 7,000 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 2000 ppm, whichever is the more restrictive.

SURVEILLANCE REQUIREMENTS

4.9.1.1 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.

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

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*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.

3/4.10 SPECIAL TEST EXCEPTIONS

3/4.10.1 SHUTDOWN MARGIN

LIMITING CONDITION FOR OPERATION

3.10.1 The SHUTDOWN MARGIN requirement of Specification 3.1.1.1 may be suspended for measurement of control rod worth and shutdown margin provided reactivity equivalent to at least the highest estimated control rod worth is available for trip insertion from OPERABLE control rod(s).

APPLICABILITY: MODE 2.

ACTION:

a. With any full-length control rod not fully inserted and with less than the above reactivity equivalent available for trip insertion immediately initiate and continue boration at greater than or equal to ~~10~~ 30 gpm of a solution containing greater than or equal to ~~20,000~~ 7,000 ppm boron or its equivalent until the SHUTDOWN MARGIN required by Specification 3.1.1.1 is restored.

b. With all full-length control rods fully inserted and the reactor subcritical by less than the above reactivity equivalent, immediately initiate and continue boration at greater than or equal to ~~10~~ 30 gpm of a solution containing greater than or equal to ~~20,000~~ 7,000 ppm boron or its equivalent until the SHUTDOWN MARGIN required by Specification 3.1.1.1 is restored.

SURVEILLANCE REQUIREMENTS

4.10.1.1 The position of each full-length control rod either partially or fully withdrawn shall be determined at least once per 2 hours.

4.10.1.2 Each full-length control rod not fully inserted shall be demonstrated capable of full insertion when tripped from at least the 50% withdrawn position within 24 hours prior to reducing the SHUTDOWN MARGIN to less than the limits of Specification 3.1.1.1.

3/4.1.1.4 MINIMUM TEMPERATURE FOR CRITICALITY

This specification ensures that the reactor will not be made critical with the Reactor Coolant System average temperature less than 541°F. This limitation is required to ensure: (1) the moderator temperature coefficient is within its analyzed temperature range, (2) the protective instrumentation is within its normal operating range, (3) the pressurizer is capable of being in an OPERABLE status with a steam bubble, and (4) the reactor vessel is above its minimum RT_{NDT} temperature.

3/4.1.2 BORATION SYSTEMS

The boron injection system ensures that negative reactivity control is available during each mode of facility operation. The components required to perform this function include: (1) borated water sources, (2) charging pumps, (3) separate flow paths, (4) boric acid transfer pumps, ~~(5) associated heat tracing systems,~~ and (~~6~~ 5) an emergency power supply from OPERABLE diesel generators.

at BOL when borating from hot zero power to COLD SHUTDOWN

With the RCS average temperature above 200°F, a minimum of two boron injection flow paths are required to ensure single functional capability in the event an assumed failure renders one of the flow paths inoperable. The boration capability of either flow path is sufficient to provide a SHUTDOWN MARGIN from expected operating conditions of 1.6% Δk/k after xenon decay and cooldown to 200°F. The maximum expected boration capability requirement occurs ~~at EOL from full power equilibrium xenon conditions~~ and requires ~~5100~~ 14,042 gallons of ~~20,000~~ 7,000 ppm borated water from the boric acid storage tanks or ~~75,000~~ 65,784 gallons of ~~2000 ppm (Unit 1 Cycle 2) and~~ 2300 ppm ~~(Unit 1 Cycle 3 and after, Unit 2)~~ borated water from the refueling water storage tank.

With the RCS temperature below 200°F, 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 change in the event the single injection system becomes inoperable.

The boron capability required below 200°F is sufficient to provide a SHUTDOWN MARGIN of 1% Δk/k after xenon decay and cooldown from 200°F to 140°F. This condition requires either ~~835~~ 2499 gallons of ~~20,000~~ 7,000 ppm borated water from the boric acid storage tanks or ~~9690~~ 17,865 gallons of ~~2000 ppm (Unit 1 Cycle 2) and~~ 2300 ppm ~~(Unit 1 Cycle 3 and after, Unit 2)~~ borated water from the refueling water storage tank.

The limits on contained water volume and boron concentration of the RWST also ensure a pH value of between 8.0 and 9.5 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.