ATTACHMENT 1

ST. LUCIE UNIT 2

BORIC ACID CONCENTRATION REDUCTION

Marked-up Technical Specification Pages

| | | |
|---|---|---|
| 3/4 | 1-7 | |
| 3/4 | 1-8 | (w/Insert) |
| 3/4 | 1-12 | |
| 3/4 | 1-13 | |
| 3/4 | 1-14 | (w/Insert) |
| 3/4 | 1-15 | (new figure) |
| 3/4 | 5-1 | |
| B3/4 | 1-2 | (w/Insert) |
| B3/4 | 5-3 | |
| B3/4 | 6-3 | |



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## 3/4.1.2 BORATION SYSTEMS

### FLOW PATHS - SHUTDOWN

### LIMITING CONDITION FOR OPERATION

3.1.2.1 As a minimum, one of the following boron injection flow paths ~~and one associated heat tracing circuit~~ shall be OPERABLE and capable of being powered from an OPERABLE emergency power source:

a. A flow path from the boric acid makeup tank via either a boric acid makeup pump or a gravity feed connection and any charging pump to the Reactor Coolant System if only the boric acid makeup tank in Specification 3.1.2.7a. is OPERABLE, or

b. The flow path from the refueling water tank via either a charging pump or a high pressure safety injection pump to the Reactor Coolant System if only the refueling water tank in Specification 3.1.2.7b. 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 above the temperature limit line shown on Figure 3.1-1 when a flow path from the boric acid makeup tanks is used.~~

a. ~~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.

b. At least once per 24 hours when the Reactor Auxiliary Building air temperature is less than 55°F by verifying that the Boric Acid Makeup Tank solution temperature is greater than 55°F. (when the flow path from the Boric Acid Makeup Tank is used.)

FLOW PATHS - OPERATING

LIMITING CONDITION FOR OPERATION

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3.1.2.2 ~~At least two of the following three boron injection flow paths and one associated heat tracing circuit shall be OPERABLE:~~

~~a. Two flow paths from the boric acid makeup tanks via either a boric acid makeup pump or a gravity feed connection, and a charging pump to the Reactor Coolant System, and~~

~~b. The flow path from the refueling water tank via a charging pump to the Reactor Coolant System.~~

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

With only one of the above required boron injection flow paths to the Reactor Coolant System OPERABLE, restore at least two boron injection flow paths to the Reactor Coolant System to OPERABLE status within 72 hours or be in at least HOT STANDBY and borated to a SHUTDOWN MARGIN equivalent to at least 3000 pcm at 200°F within the next 6 hours; restore at least two flow paths to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.

SURVEILLANCE REQUIREMENTS

4.1.2.2 At least two 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 makeup tanks is above the temperature limit line shown on Figure 3.1-1.~~

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 during shutdown by verifying that each automatic valve in the flow path actuates to its correct position on an SIAS test signal.

d. At least once per 18 months by verifying that the flow path required by Specification 3.1.2.2a and 3.1.2.2b delivers at least 40 gpm to the Reactor Coolant System.



INSERT - At least once per 24 hours, when the Reactor Auxilary Building air temperature is below 55°F, by verifying that the solution temperature of the Boric Acid Makeup Tanks is above 55°F.

INSERT FOR PAGE 3/4 1-8

3.1.2.2 At least two of the following three boron injection flow paths shall be OPERABLE:

a. One flow path from the boric acid makeup tank(s) with the tank meeting Specification 3.1.2.8 part a) or b), via a boric acid makeup pump through a charging pump to the Reactor Coolant System.

b. One flow path from the boric acid makeup tank(s) with the tank meeting Specification 3.1.2.8 part a) or b), via a gravity feed valve through a charging pump to the Reactor Coolant System.

c. The flow path from the refueling water storage tank via a charging pump to the Reactor Coolant System.

OR

At least two of the following three boron injection flow paths shall be OPERABLE:

a. One flow path from each boric acid makeup tank with the combined tank contents meeting Specification 3.1.2.8 c), via both boric acid makeup pumps through a charging pump to the Reactor Coolant System.

b. One flow path from each boric acid makeup tank with the combined tank contents meeting Specification 3.1.2.8 c), via both gravity feed valves through a charging pump to the Reactor Coolant System.

c. The flow path from the refueling water storage tank, via a charging pump to the Reactor Coolant System.

## BORIC ACID MAKEUP PUMPS - OPERATING

### LIMITING CONDITION FOR OPERATION

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3.1.2.6 At least the boric acid makeup pump(s) in the boron injection flow path(s) required OPERABLE pursuant to Specification 3.1.2.2 shall be OPERABLE and capable of being powered from an OPERABLE emergency bus if the flow path through the boric acid pump(s) in Specification 3.1.2.2 is OPERABLE.

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APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

DELETE

With one boric acid makeup pump required for the boron injection flow path(s) pursuant to Specification 3.1.2.2 inoperable, restore the boric acid makeup pump 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 3000 pcm at 200°F; restore the above required boric acid makeup pump(s) to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.

### SURVEILLANCE REQUIREMENTS

4.1.2.6 The above required boric acid makeup pump(s) shall be demonstrated OPERABLE by verifying, that on recirculation flow, the pump(s) develop a discharge pressure of greater than or equal to 90 psig when tested pursuant to Specification 4.0.5.

## BORATED WATER SOURCES - SHUTDOWN

### LIMITING CONDITION FOR OPERATION

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

a. One boric acid makeup tank ~~and at least one associated heat tracing circuit~~ with a minimum ~~contained volume of 4150 gallons of 8~~ borated water volume of 3550 gallons of 2.5 to 3.5 weight percent ~~boron.~~ boric acid (4371 to 6119 ppm boron).

b. The refueling water tank with:

1. A minimum contained borated water volume of 125,000 gallons,
2. A minimum boron concentration of 1720 ppm, and
3. A solution temperature between 40°F and 120°F.

APPLICABILITY: MODES 5 and 6.

ACTION:

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

### SURVEILLANCE REQUIREMENTS

4.1.2.7 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 of the tank, and

DELETE ~~3. Verifying the boric acid makeup tank solution temperature when it is the source of borated water~~.

b. At least once per 24 hours by verifying the RWT temperature when it is the source of borated water and the outside air temperature is outside the range of 40°F and 120°F.

Add.- c. At least once per 24 hours when the Reactor Auxiliary Building air temperature is less than 55°F, by verifying that the boric acid makeup tank solution temperature is greater than 55°F when that boric acid makeup tank is required to be OPERABLE.

## BORATED WATER SOURCES - OPERATING

### LIMITING CONDITION FOR OPERATION

3.1.2.8 At least two ~~Each~~ of the following four borated water sources shall be OPERABLE:

~~a. At least one boric acid makeup tank and at least one associated heat tracing circuit per tank with the contents of the tank in accordance with Figure 3.1-1, and~~

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d. ~~b.~~ The refueling water tank with:

1. A minimum contained borated water volume of 417,100 gallons,
2. A boron concentration of between 1720 and 2100 ppm of boron, and
3. A solution temperature between 55°F and 100°F.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With the above required boric acid makeup tank(s) inoperable, restore the tank(s) 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 3000 pcm at 200°F; restore the above required boric acid makeup tank(s) to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.

b. With the refueling water tank 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

4.1.2.8 At least two required ~~Each~~ borated water sources shall be demonstrated OPERABLE:

a. At least once per 7 days by:
   1. Verifying the boron concentration in the water, and
   2. Verifying the contained borated water volume of the water source. ~~and~~
   ~~3. Verifying the boric acid makeup tank solution temperature.~~

b. At least once per 24 hours by verifying the RWT temperature when the outside air temperature is outside the range of 55°F and 100°F.

Add- c. At least once per 24 hours when the Reactor Auxiliary Building air temperature is less than 55°F, by verifying that the boric acid makeup tank solution is greater than 55°F.

INSERT PAGE 3/4 1-14

a. Boric Acid Makeup Tank 2A in accordance with Figure 3.1-1.

b. Boric Acid Makeup Tank 2B in accordance with Figure 3.1-1.

c. Boric Acid Makeup Tanks 2A and 2B with a minimum combined contained borated water volume in accordance with Figure 3.1-1.

Delete and Replace with New Figure 3.1-1

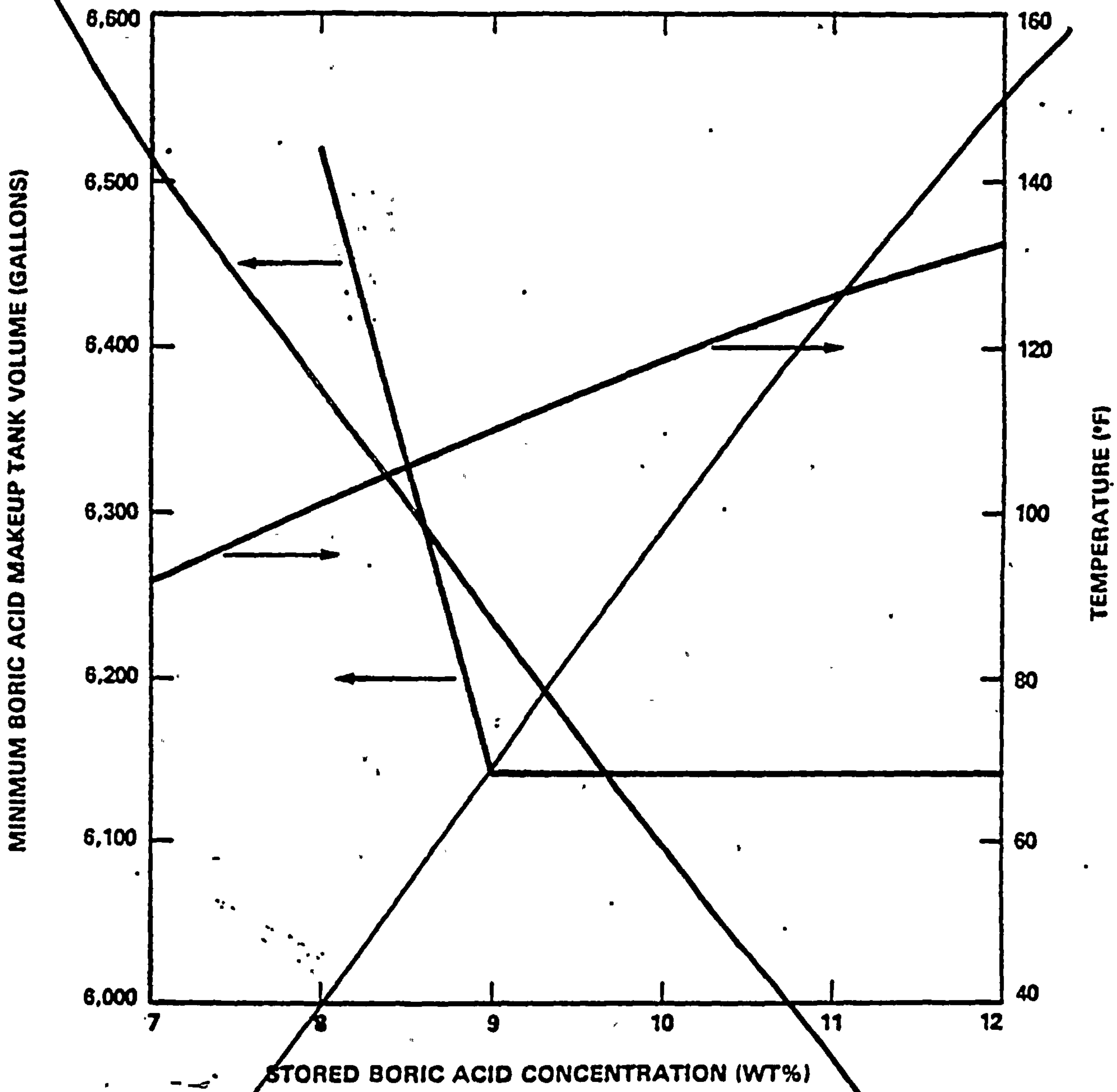
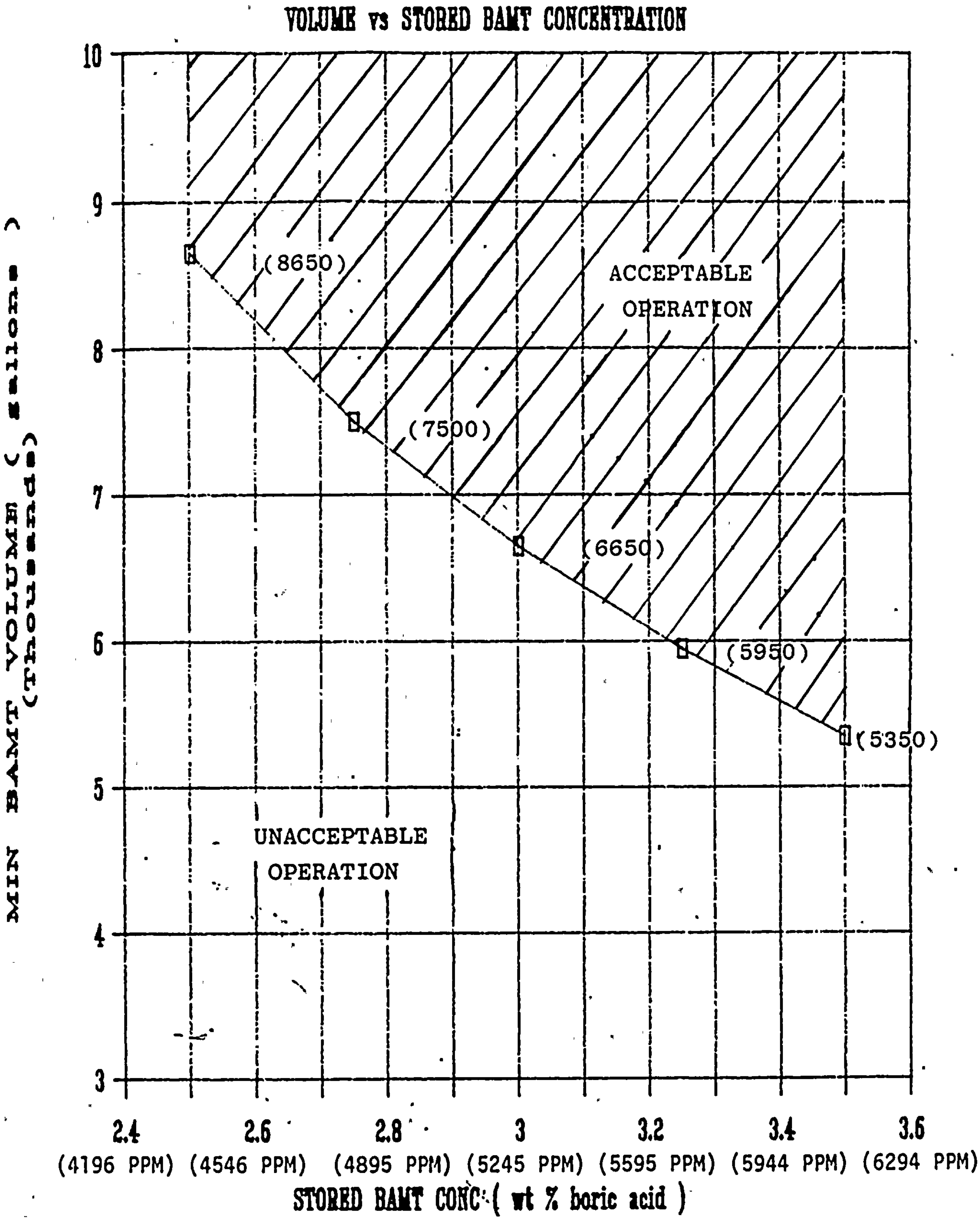



Figure 3.1-1
Minimum boric acid makeup tank volume and temperature as a function of stored boric acid concentration

# FIGURE 3.1-1 ST. LUCIE 2 MIN BAMT



## 3/4.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

### 3/4.5.1 SAFETY INJECTION TANKS

#### LIMITING CONDITION FOR OPERATION

3.5.1 Each Reactor Coolant System safety injection tank shall be OPERABLE with:

a. The isolation valve open,

b. A contained borated water volume of between 1420 and 1556 cubic feet,

c. A boron concentration of between 1720 and 2100 ppm of boron, and

d. A nitrogen cover-pressure of between 570 and 650 psig.

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

ACTION:

a. With one safety injection tank inoperable, except as a result of a closed isolation valve, restore the inoperable tank to OPERABLE status within 1 hour or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours.

b. With one safety injection tank inoperable due to the isolation valve being closed, either immediately open the isolation valve or be in at least HOT STANDBY within 1 hour and be in HOT SHUTDOWN within the next 12 hours.

#### SURVEILLANCE REQUIREMENTS

4.5.1.1 Each safety injection tank shall be demonstrated OPERABLE:

a. At least once per 12 hours by:

1. Verifying (by the absence of alarms) the contained borated water volume and nitrogen cover-pressure in the tanks, and

2. Verifying that each safety injection tank isolation valve is open.

*With pressurizer pressure greater than or equal to 1750 psia. When pressurizer pressure is less than 1750 psia, at least three safety injection tanks shall be OPERABLE, each with a minimum pressure of 235 psig and a maximum pressure of 650 psig and a contained water volume of between 1250 and ~~1540~~ 1556 cubic feet with a boron concentration of between 1720 and 2100 ppm of boron. With all four safety injection tanks OPERABLE, each tank shall have a minimum pressure of 235 psig and a maximum pressure of 650 psig and a contained water volume of between 833 and ~~1540~~ 1556 cubic feet with a boron concentration of between 1720 and 2100 ppm of boron. In MODE 4 with pressurizer pressure less than 276 psia, the safety injection tanks may be isolated.

3/4.1.1.5 MINIMUM TEMPERATURE FOR CRITICALITY

This specification ensures that the reactor will not be made critical with the Reactor Coolant System average temperature less than 515°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 pressure 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 makeup pumps, ~~(5) associated heat tracing systems,~~ and (~~6~~ 5) an emergency power supply from OPERABLE diesel generators.

With the RCS average temperature above 200°F, a minimum of two separate and redundant boron injection systems are provided to ensure single functional capability in the event an assumed failure renders one of the systems inoperable. Allowable out-of-service periods ensure that minor component repair or corrective action may be completed without undue risk to overall facility safety from injection system failures during the repair period.

The boration capability of either system is sufficient to provide a SHUTDOWN MARGIN from expected operating conditions of 3000 pcm 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 boric acid solution from the boric acid makeup tanks in the allowable concentrations and volumes of Specification 3.1.2.8 or 72,000 gallons of 1720 ppm - 2100 ppm borated water from the refueling water tank.~~

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With the RCS temperature below 200°F one 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 injection system becomes inoperable.

The boron capability required below 200°F is based upon providing a 3000 pcm SHUTDOWN MARGIN after xenon decay and cooldown from 200°F to 140°F. This condition requires either ~~4,150~~ 6150 gallons of 1720 ppm - 2100 ppm borated water from the refueling water tank or ~~boric acid solution from the boric acid makeup tanks in accordance with the requirements of Specification 3.1.2.7~~ 3550 gallons of 2.5 to 3.5 weight percent boric acid solution from the boric acid makeup tanks.

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

The OPERABILITY of one boron injection system during REFUELING ensures that this system is available for reactivity control while in MODE 6.

The limits on contained water volume and boron concentration of the RWT also ensure a pH value of between 7.0 and ~~11.0~~ 8.0 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.

INSERT PAGE B 3/4 1-2

This requirement can be met for a range of boric acid concentrations in the Boric Acid Makeup Tank (BAMT) and Refueling Water Tank (RWT). This range is bounded by 5350 gallons of 3.5 wt. % (6119 ppm boron) from the BAMT and 16,000 gallons of 1720 ppm borated water from the RWT to 8650 gallons of 2.5 wt. % (4371 ppm boron) boric acid from BAMT and 12,000 gallons of 1720 ppm borated water from the RWT. A minimum of 35,000 gallons of 1720 ppm boron is required from the RWT if it is to be used to borate the RCS alone.

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EMERGENCY CORE COOLING SYSTEMS

BASES

REFUELING WATER TANK (Continued)

The contained water volume limit includes an allowance for water not usable because of tank discharge line location or other physical characteristics.

The limits on contained water volume and boron concentration of the RWT also ensure a pH value of between 7.0 and ~~11.0~~ 8.0 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.

CONTAINMENT SYSTEMS

BASES

CONTAINMENT SPRAY SYSTEM (Continued)

The Containment Spray System and the Containment Cooling System provide post-accident cooling of the containment atmosphere. However, the Containment Spray System also provides a mechanism for removing iodine from the containment atmosphere and therefore the time requirements for restoring an inoperable spray system to OPERABLE status have been maintained consistent with that assigned other inoperable ESF equipment.

3/4.6.2.2 IODINE REMOVAL SYSTEM

The OPERABILITY of the Iodine Removal System ensures that sufficient $N_2H_4$ is added to the containment spray in the event of a LOCA. The limits on $N_2H_4$ volume and concentration ensure a minimum of 50 ppm of $N_2H_4$ concentration available in the spray for a minimum of 6.5 hours per pump for a total of 13 hours to provide assumed iodine decontamination factors on the containment atmosphere during spray function and ensure a pH value of between 7.0 and ~~11.0~~ 8.0 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 contained water volume limit includes an allowance for water not usable because of tank discharge line location or other physical characteristics. These assumptions are consistent with the iodine removal efficiency assumed in the safety analyses.

3/4.6.2.3 CONTAINMENT COOLING SYSTEM

The OPERABILITY of the Containment Cooling System ensures that (1) the containment air temperature will be maintained within limits during normal operation, and (2) adequate heat removal capacity is available when operated in conjunction with the Containment Spray Systems during post-LOCA conditions.

The Containment Cooling System and the Containment Spray System provide post-accident cooling of the containment atmosphere. As a result of this cooling capability, the allowable out-of-service time requirements for the Containment Cooling System have been appropriately adjusted. The allowable out-of-service time requirements for the Containment Spray System and Containment Cooling System have been maintained consistent with that assigned other inoperable ESF equipment since the Containment Spray System and Containment Cooling System also provide a mechanism for removing iodine from the containment atmosphere.

<u>ATTACHMENT 2</u>

ST. LUCIE UNIT 2

Boric Acid Concentration Reduction

Safety Analysis

EJWBACR

(Attachment 2)

# ST. LUCIE UNIT 2
# BORIC ACID CONCENTRATION REDUCTION

## SAFETY ANALYSIS

## 1.0 INTRODUCTION

The proposed changes would revise the requirements for the boric acid makeup system. These changes would remove the requirement to heat trace a majority of the Boric Acid Makeup system, reduce the allowable boron concentration requirements and increase the water volume to meet the shutdown margin requirements of Technical Specifications 3.1.1.1 and 3.1.1.2. In addition, the post LOCA containment sump chemistry has been reevaluated to determine the affect of boric acid concentration reduction.

## 2.0 DISCUSSION

The proposed changes would modify the requirements for the boric acid makeup system which is used to provide an adequate volume of borated water into the reactor coolant system (RCS) to assure that the shutdown margin meets the requirements of Technical Specifications 3.1.1.1 and 3.1.1.2. The existing plant design requires the heat tracing circuits for the Boric Acid Makeup system to be operable in order to maintain the temperature of fluid in the Boric Acid Makeup system high enough to prevent the boric acid from precipitating at ambient temperatures and thus assure the Boric Acid Makeup system functions properly. In order to increase plant operational flexibility and improve Boric Acid Makeup system reliability, it is proposed that the requirement to heat trace the Boric Acid Makeup system be deleted. The following changes are proposed to allow removal of heat tracing:

1) The boron concentration requirements for the Boric Acid Makeup system will be reduced from a range of 8.0 to 12.0 weight percent to 2.5 to 3.5 weight percent boric acid. This reduction in boric acid concentration will prevent boron precipitation at ambient temperatures in the auxiliary building after the heat tracing is removed.

2) Increase the upper range of the required borated water volume for the Boric Acid Makeup system from 6,520 gallons to 8,650 gallons to assure that the existing requirements for the shutdown margin specified in Technical Specifications 3.1.1.1 and 3.1.1.2 are met with the proposed requirements for lower boron concentration. In addition a topical report, Boric Acid Makeup Tank Concentration Reduction Effort CEN-365(L) has been submitted to support the request for the proposed changes. The revised Technical Specifications 3/4.1.2.1, 3/4.1.2.2, 3/4.1.2.6, 3/4.1.2.7, 3/4.1.2.8 and the Bases 3/4.1.2 are submitted for review and approval.

## 3.0 EVALUATION

The proposed changes of requirements for the Boric Acid Makeup system, the associated Technical Specification changes and the topical report (CEN-365(L)) are discussed below.

## 3.1 BORATION CAPACITY

The methodology and analytical results to support the request for the Technical Specification changes are documented in the topical report (CEN-365(L)) and include two distinct series of calculations for the required and available boron concentrations in the RCS to maintain a safe shutdown margin. Both are employed at each time of interest in the plant cooldown conditions.

### 3.1.1 Evaluation of Analysis for Required Boron Concentration

The analysis for the required boron concentration is based on the shutdown requirements of Branch Technical Position 5.1 for a class 2 plant (Standard Review Plan Section 5.4.7). Specifically, the shutdown margin requirements are consistent with that specified in Technical Specifications 3.1.1.1 and 3.1.1.2 for Operating Modes 1 through 4, and 5 through 6, respectively. Conservative core physics parameters were used to calculate the boron concentration required to be present in the RCS for the shutdown margins required by the Technical Specifications. In the analysis, the analytical and measurement uncertainties were included to ensure that the upper bound boron requirements were predicted. The uncertainties include -13% in scram worth,±10% in moderator temperature feedback, ±15% in Doppler reactivity feed back and the time constant of 26 hours for xenon decay to maximize the xenon poison effect.

### 3.1.2 Evaluation of Analysis for Available Boron Concentration

The calculated method to determine the available boron concentration is based on a steady state mass balance for boron in the entire RCS. It is assumed that the borated water added to the RCS is equal to the fluid volume contraction due to the cooldown while the pressurizer water level is maintained constant. In the analysis (CEN-365(L)), various core conditions were considered to minimize the available boron reactivity effect. The limiting core conditions identified and used in the analyses were: (1) end-of-cycle conditions with initial RCS concentrations at zero ppm boron, (2) the core with the most reactive control rod fully stuck out, (3) plant power at 100% with 100% equilibrium xenon prior to initiation of plant shutdown, (4) a slow plant cooldown rate of 12.5°F/hr., (5) end-of-cycle moderator cooldown effects and (6) end-of-cycle boron reactivity worths.

These assumptions are conservative with respect to minimizing the boron reactivity affects since assumptions (1) and (2) minimize the existing boron within the core and available scram worth, assumptions (3) and (4) maximize the xenon poison effect and assumption (5) maximizes the boration requirements due to moderator cooldown effects.

End of cycle (EOC) inverse boron worth (IBW) data was used in combination with EOC reactivity insertion rates normalized to the Most Negative Technical Specification Moderator Temperature Coefficient (MTC) limit since it was known that this yields results that are more limiting than the combination of actual MTC and actual IBW values at all periods through the fuel cycle prior to end-of-cycle.

The use of a cooldown rate of 12.5°F/hr is consistent with the plant test procedures for the boron mixing test performed during a natural circulation test at another Combustion Engineering plant. Included in CEN-365(L) is an analysis that demonstrates that the boration requirements for the fastest cooldown rate of 100°F/hr., as allowed by Technical Specifications is

[illegible]

[illegible]

bounded by the case when the cooldown rate was limited to 12.5°F/hr.

In conclusion, the topical report used a conservative method to calculate the required boron concentration necessary to maintain the shutdown margin required by Technical Specifications 3.1.1.1 and 3.1.1.2 during a safe shutdown scenario. A conservative RCS makeup scenario was used to demonstrate that proposed boron concentration and volume requirements for the Boric Acid Makeup tanks (BAMTs) will maintain the safe shutdown margins required by the technical specifications.

## 3.2 TRANSIENT AND ACCIDENT EVALUATION

As stated in Section 2.6 of CEN-365(L) credit is not taken for boron addition to the reactor coolant system from the boric acid makeup tanks for the purpose of reactivity control in the accidents analyzed in Chapter 15 of the plant's Final Safety Analysis Report. The response of an operator, therefore, to such events as steam line break, overcooling, boron dilution, etc., will not be affected by a reduction in BAMT concentration. In particular, the action statements associated with Technical Specification 3.1.1.2 require that boration be commenced at greater than 40 gallons per minute using a solution of at least 1720 ppm boron in the event that shutdown margin is lost. Such statements are conservatively based upon the refueling water tank concentration and are therefore independent of the amount of boron in the BAMTs. It should be noted that even after reducing the boron concentration in the BAMT, the minimum boron concentration in these tanks is higher than 1720 ppm.

Similar to the Technical Specification action steps in the event of a loss of shutdown margin, the operator guidance in Combustion Engineering's Emergency Procedure Guidelines (EPG)s, CEN-152, Rev. 2, are also independent of specific boron concentrations within the boric acid makeup tanks. Specifically, the acceptance criteria developed for the reactivity control section of the Functional Recovery Guidelines of CEN-152 are based upon a boron addition rate from the chemical and volume control system of 40 gallons per minute without reference to a particular boration concentration. The reduction in boron concentration within the boric acid makeup tanks therefore has no impact on, and does not change, the guidance contained in the EPGs.

## 3.3 EQUIPMENT EVALUATION

Two distinct evaluations were performed to analyze the impact of the reduction of boric acid concentrations on equipment. These evaluations consider the effect of the reduced boric acid concentrations on containment sump and spray and on the boric acid makeup system components.

### 3.3.1 Evaluation of the Impact on Boric Acid Makeup Components

An evaluation has been performed to identify those components in the boric acid makeup system that would be affected by the reduction of boric acid concentrations. Boric acid concentration will be reduced from a range of 8 to 12 weight percent to a range of 2.5 to 3.5 weight percent. In addition, the normal operating temperature will be changed from a range of 120-160 degrees F to maintaining the temperature above 55 degrees F. The safety related portions of the BAM system that must operate properly to deliver an adequate amount of boric acid during a safe shutdown scenario include, piping, valves, boric acid makeup tank(s) and the boric acid makeup pumps. A reduction in the boric acid concentration or temperature will not affect

the operation of the pumps, piping or valves. The only equipment potentially affected by this change are the level instruments of the boric acid makeup tanks. Since the normal operating tank temperature will be lowered, the level transmitters will require recalibration to provide accurate level indications. High and low level setpoints will also be examined. Deenergizing the Boric Acid Makeup system heat tracing will require an alternative means to verify that the temperature is above the precipitation point of the fluid. Administrative controls will be instituted to verify that the auxiliary building temperature is adequately monitored. Ensuring that the Auxiliary building temperature is greater than 55 degrees F will ensure that the boric acid will not precipitate out of solution.

### 3.3.2 Evaluation of the Impact on Containment Sump pH and Affected Equipment

The existing post LOCA long term Containment Sump Inventory calculation was recalculated to reflect the new operating parameters as a result of the reduction in boric acid concentration in the Boric Acid Makeup tanks.

Two scenarios were considered. The first would result in a maximum post LOCA containment sump boric acid concentration and the second would result in a minimum boric acid concentration. Both scenarios were also analyzed for a loss of offsite power where only one emergency train was available during the LOCA (assume one emergency diesel generator fails to start). With this information, it is possible to compute the pH value for each case.

The results of the calculation establish that the post LOCA long term containment sump and spray chemistry shall have new bounding values for boric acid concentration and pH:

| | Maximum | Minimum |
|---|---|---|
| Boric Acid Concentration | 2225 ppm boron | 0 ppm boron |
| pH | 8.00 | 7.00 |

The Equipment Qualification Documentation Packages were reviewed to determine if the new boric acid concentration and pH ranges are bounded by the currently specified ranges for Environmental Qualification during a LOCA. The determination is that the equipment in the containment can be qualified for the new bounding values of the boric acid concentrations and pH values.

An evaluation was performed to determine the effect of the new pH range on mechanical systems and components due to corrosion. By maintaining the pH of the long term Containment Sump and Spray System to between 7.0 and 8.0, the evolution of iodine and the effect of chloride and caustic stress are minimized.

## 4.0 REACTOR AUXILIARY BUILDING TEMPERATURE MEASUREMENT

The proposed changes reduce the concentration in the Boric Acid Makeup Tanks to a maximum concentration of 3.5 weight percent boric acid. Chemical analyses have shown that a 3.5 weight percent solution of boric acid will not precipitate at solution temperatures above 50°F. The proposed changes also include a surveillance requirement to assure that the borated water source is operable by verifying that the temperature in the BAMT is above

55°F whenever the auxiliary building temperature is below 55°F.

The affected heat traced piping/components which comprise the boric acid makeup system are located in relatively close proximity on the -0.5 ft. elevation of the reactor auxiliary building. In addition, the RAB ventilation system is designed to maintain a uniform temperature throughout the building. .Based upon the above, the reactor auxiliary building air temperature will be taken at the boric acid makeup station hallway on the minus 0.5 foot elevation.

## 5.0 TECHNICAL SPECIFICATION CHANGES

The Technical Specification changes and the reason for their acceptability are provided below.

Technical Specification 3/4.1.2.1 Boration Systems Flow Paths - Shutdown

The proposed change to the Technical Specifications eliminates the requirement for heat tracing of the boric acid makeup system. The design purpose of heat tracing of the Boric Acid Makeup system is to maintain the temperature of fluid in the Boric Acid Makeup tanks and the boration flowpaths high enough to prevent the boric acid from precipitating. The proposed changes to T.S. 3/4.1.2.7 and T.S. 3/4.1.2.8 reduce the concentration in the Boric Acid Makeup tanks to a maximum concentration of 3.5 weight percent boric acid, which will not precipitate at the borated water temperature higher than 55°F. Chemical analyses have shown that a 3.5 weight percent solution of boric acid will remain dissolved (i.e., will not precipitate or "plate out") at solution temperatures above 50°F. The proposed changes also include a surveillance requirement to assure that the borated water source is operable by verifying that the temperature in the BAMT is above 55°F whenever the auxiliary building temperature is below 55°F. Consistent with the new surveillance requirement above, the old surveillance requirement to verify the flow path temperature above the temperature limit line on Figure 3.1-1 has been deleted.

Technical Specification 3/4.1.2.2 Flow Paths - Operating

Currently, the Technical Specifications require two out of the following three flow paths be operable for boron injection into the RCS: (1) a Boric Acid Makeup tank gravity feed path and associated heat tracing, (2) a Boric Acid Makeup tank path via a boric acid makeup pump and associated heat tracing, or (3) flow path from the refueling water tank.

The proposed changes require a flow path from any credited source of water (refueling water tank and/or Boric Acid Makeup tank (or tanks)) to be operable. These changes are consistent with the assumptions used in the topical report, CEN-365(L).

The proposed change to the Technical Specification eliminates the requirement for heat tracing of the Boric Acid Makeup system. As in Technical Specification 3/4.1.2.1 deletion of the requirement to heat trace the Boric Acid Makeup system is consistent with the ability of the boric acid to remain in solution at temperature above 50°F. The proposed change includes a surveillance requirement to assure that the borated water source is operable by verifying that the temperature in the BAMT is above 55°F whenever the auxiliary building temperature is below 55°F. As in Technical Specification 3/4.1.2.1 the old surveillance requirement for temperature verification of the flow path from the boric acid makeup tanks has been

deleted.

Technical Specification 3/4.1.2.7 Borated Water Sources - Shutdown

The existing Technical Specification requires that one of the two Boric Acid Makeup tanks and its associated heat tracing be operable with the tank containing 8 weight percent boron and a minimum content of 4150 gallons. The proposed change will delete the heat tracing operability requirement, lower the boric acid concentration to a range of 2.5 to 3.5 weight percent, change the minimum Boric Acid Makeup tank content to 3550 gallons and modify the surveillance requirement to verify that the Boric Acid Makeup tank temperature is above 55°F whenever the auxiliary building temperature is below 55°F. As in Technical Specification 3/4.1.2.1 the old surveillance requirement to verify the temperature of the flow path from the boric acid makeup tanks has been deleted. These changes are consistent with the analysis presented in CEN-365(L), which demonstrates adequate boration capability at the lower boric acid concentrations and the ability for boric acid to remain in solution at these concentrations at temperatures above 50°F.

Figure 3.1-1 (for Operating Modes 1 to 4)

The figure specifies the minimum required Boric Acid Makeup water volume and temperature as a function of stored boric acid concentration. The revised figure specifies the minimum required water volume (contained in one or both Boric Acid Makeup tanks) above zero percent tank level as a function of boric acid concentration in the Boric Acid Makeup tank. This curve was generated in the topical report for a minimum refueling water tank boron concentration of 1720 ppm boron. This curve conservatively bounds Boric Acid Makeup tank minimum required water volumes for conditions when the refueling water tank boron concentration is greater than 1720 ppm. The range of boron concentration in the Boric Acid Makeup tank has been reduced from 8.0 to 12.0 weight percent boric acid to 2.5 to 3.5 weight percent. The upper range of the required borated water volume increases from 6,520 gallons to 8,650 gallons. The revised Figure 3.1-1 is consistent with the analytical results of the topical report (CEN-365(L)) for plant conditions at Operating Modes 1 through 4 to maintain the required safe shutdown margin. The temperature versus BAMT concentration curve has been removed since it is no longer required.

Technical Specification 3/4.1.2.8 Borated Water Sources - Operating

The current Technical Specification requires that at least one Boric Acid Makeup tank and its associated heat tracing be operable with the contents of the tank in accordance with the existing Figure 3.1-1.

The existing Figure 3.1-1 specifies the maximum volume of the BAMT to be 6,520 gallons at a minimum concentration of 8.0 weight percent. The proposed changes are to provide a new range of boric acid concentration of 2.5 to 3.5 weight percent for one or both of the Boric Acid Makeup tanks. The revised volumes of Figure 3.1-1 lower the minimum water volume to 5,350 gallons. Deletion of the requirement to heat trace the Boric Acid Makeup system is consistent with the ability to maintain 2.5 to 3.5 weight percent boric acid in solution at temperatures above 50°F. The revised surveillance requirements deletes verifying Boric Acid Makeup tank temperature unless the auxiliary building temperature is below 55°F. As a conservatism, this verification of temperature is done more frequently and the old surveillance requirement has been deleted.

Technical Specification 3/4.5.1 Safety Injection Tanks

The existing Technical Specification requires each reactor coolant system Safety Injection Tank (SIT) to contain a borated water volume of 1540 cubic feet maximum in Modes 3 and 4 when the pressurizer pressure is less than 1750 psia. The maximum SIT volumes specified are not consistent with the maximum volume requirement (1556 cubic feet) for the SIT's in Modes 1, 2 and 3 when the pressurizer pressure is above 1750 psia. Technical Specification 3/4.5 is to be revised to correct the inconsistency.

Bases - 3/4.1.2 Boration Systems

The Technical Specification defines the required components for the boron injection system which ensure that negative reactivity is available during each mode of operation and define boric acid concentration and volume requirements for the Boric Acid Makeup tanks and refueling water tank (RWT).

For Modes 1 through 4 the proposed changes revise the boric acid concentration and volume requirements for the Boric Acid Makeup tank in accordance with the proposed Figure 3.1-1 and the corresponding minimum required borated water volumes of between 12,000 and 16,000 gallons with boron concentration of 1720 ppm from the RWT or 40,000 gallons with boron concentration of 1720 ppm from the RWT alone.

For Modes 5 and 6 the proposed changes revise the boric acid concentration and volume requirements of the Boric Acid Makeup tanks and the RWT to be consistent with the analyses in the topical report CEN-365(L).

The pH values for the solution recirculated within containment after a LOCA is incorrectly specified as between 7.0 and 11.0. The correct pH is between 7.0 and 8.0. The Bases are revised to delineate the correct pH range.

Bases - 3/4.5 Emergency Core Cooling Systems

The pH values for the solution recirculated within containment after a LOCA is incorrectly specified as between 7.0 and 11.0. The correct pH is between 7.0 and 8.0. The Bases are revised to delineate the correct pH range.

Bases - 3/4.6 Containment Systems

The pH values for the solution recirculated within containment after a LOCA is incorrectly specified as between 7.0 and 11.0. The correct pH is between 7.0 and 8.0. The Bases are to be revised delineate the correct pH range.

ATTACHMENT 3

ST. LUCIE UNIT 2

BORIC ACID CONCENTRATION REDUCTION

DETERMINATION OF NO SIGNIFICANT HAZARDS CONSIDERATION

(Attachment 3)

# ST. LUCIE UNIT 2
# BORIC ACID CONCENTRATION REDUCTION

## NO SIGNIFICANT HAZARDS EVALUATION

The proposed changes have been deemed not to involve a significant hazards consideration 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 50.91, that a proposed amendment to an operating license for a facility licensed under 50.21(b) or 50.22 or for 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.

It has been determined that the activities associated with this amendment request do not meet any of the significant hazards consideration standards of 10 CFR 50.92(c) and, accordingly, a no significant hazards consideration finding is justified. In support of this determination, background information is provided in Section 4.0. A discussion of each of the above three significant hazards consideration standards is provided below.

Evaluation:

The following evaluation demonstrates that the proposed amendment involves no significant hazards considerations.

1. Involve a significant increase in the probability or consequences of an accident previously evaluated.

The operation of the facility in accordance with the proposed changes does not involve a significant increase in the probability or consequences of any accident previously evaluated. Deleting the requirement for a heat tracing circuit by reducing the boron concentration in the BAMTs is accounted for by increasing the volume of boric acid solution that must be contained in the tanks and by also crediting borated water from the RWT. Since the components (or their function) necessary to perform a safe shut down have not been changed or modified, this change does not significantly increase the probability or consequences of any accident previously evaluated. In addition, administrative controls on the boric acid makeup tank temperature and boron concentration ensure that the lack of heat tracing does not result in precipitation of the boron.

The reduction in boric acid concentration in the boric acid makeup tanks has been evaluated to determine the effect of this reduction on containment sump pH and boric acid concentration. The existing post LOCA Containment Sump Inventory calculation was recalculated to reflect the new operating parameters as a result of the reduction in boric acid concentration in the

Boric Acid Makeup tanks. The results of the calculation establish that the post LOCA long term containment sump and spray chemistry shall have new bounding values for boric acid concentration and pH. The Equipment Qualification Documentation Packages were reviewed to determine if the new boric acid concentration and pH ranges are bounded by the currently specified ranges for Environmental Qualification during a LOCA. The determination is that the equipment in the containment can be qualified for the new bounding values of the boric acid concentrations and pH values.

An evaluation was performed to determine the effect of the new pH range on mechanical systems and components due to corrosion. By maintaining the pH of the long term Containment Sump and Spray System to between 7.0 and 8.0, the evolution of iodine and the effect of chloride and caustic stress are minimized.

Credit is not taken for boron addition to the reactor coolant system from the boric acid makeup tanks for the purpose of reactivity control in the accidents analyzed in Chapter 15 of the plant's Final Safety Analysis Report. Response to such events as steam line break, overcooling, boron dilution, etc., will not be affected by a reduction in the BAMT concentration. In particular, the action statements associated with Technical Specification 3.1.1.2 require that boration be commenced at greater than 40 gallons per minute using a solution of at least 1720 ppm boron in the event that shutdown margin is lost. As noted before the BAMT boron concentration after it is reduced will be in excess of 1720 ppm.

2. <u>Create the possibility of a new or different kind of accident from any accident previously evaluated.</u>

The operation of the facility in accordance with the proposed changes does not create the possibility of a new or different kind of accident from any accident previously evaluated. The reason for requiring a heat tracing circuit was to ensure that the dissolved boric acid was in solution and hence, available for injection into the Reactor Coolant System to adjust core reactivity throughout core life. By lowering the boron concentration to a maximum of 3.5 weight percent, chemical analyses have shown there is no possibility of the boron precipitating out of solution as long as the temperature of the boric acid remains above 50°F; thus there is no longer a need for heat tracing. Since the boron will be in solution when the BAMT flowpaths are credited for reactivity control during a safe shutdown scenario, heat tracing is no longer required to maintain the Boric Acid Makeup system operable. In conclusion, this change does not create the possibility of a new or different kind of accident from those previously evaluated.

3. <u>Involve a significant reduction in a margin of safety.</u>

The operation of the facility in accordance with the proposed Technical Specification changes does not involve a significant reduction in the margin of safety. The intent of these Technical Specifications is to ensure that there are two redundant flowpaths from the borated water sources (BAMTs and RWT) to the reactor coolant system to allow control of core reactivity throughout core life. This requires that sufficient quantities of boron be stored in the BAMTs and that this borated water can be delivered to the RCS in the event of a single active failure of a system component or a seismic event. Reducing the maximum boric acid concentration to less than 3.5 weight percent has been compensated for by increasing the required minimum volumes of borated water. In addition, reducing the

maximum boron concentration allows a deletion of the requirement to heat trace the Boric Acid Makeup system since chemical analyses have shown that a 3.5 weight solution of boric acid will remain in solution at temperatures above 50°F. Administrative controls on the boric acid makeup tank temperature and boron concentration ensure that a lack of heat tracing does not result in precipitation of the boron. In conclusion, the reduction of boric acid concentration and the deletion of heat tracing in the Boric Acid Makeup system does not cause a significant reduction in the margin of safety for this plant.

In summation, it has been shown that the proposed modifications and proposed Technical Specifications do <u>not</u>:

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 reaction in a margin of safety.

Therefore, it is determined that the proposed amendment involves no significant hazards considerations.