SUPPLEMENT 1
TO
BORIC ACID CONCENTRATION REDUCTION EFFORT

CEN-353(F)

TECHNICAL BASES AND OPERATIONAL ANALYSIS

SAINT LUCIE NUCLEAR POWER PLANT UNIT 1

PREPARED FOR FLORIDA POWER & LIGHT COMPANY

BY

ABB COMBUSTION ENGINEERING NUCLEAR SERVICES

TABLE OF CONTENTS

1.0 Purpose and Scope

The purpose of this Supplement to the Boric Acid Concentration Reduction (BACR) report is to provide an adjustment to the Boric Acid Makeup Tank (BAMT) Volume and concentration requirements for the St. Lucie Unit 1 Technical Specifications Section 3.1.2.8. This adjustment is due only to revising an assumption that was made in the BACR Report, CEN-353(F), Rev 03.

This supplement modifies an original assumption that the BAMT would be needed as the source of fluid for depressurization of the RCS from 2200 psia to the High Pressure Safety Injection (HPSI) pump shutoff head. The depressurization would require additional inventory if the motor operated valve between the Refueling Water Tank (RWT) and the charging pump suction, V2504, failed to open automatically,and could not be opened manually. Once the depressurization occurred, the cooldown could be continued using fluid from the RWT. This revision now assumes that V2504 can be opened manually, therefore, the BAMT inventory needed to depressurize to the HPSI pump shutoff head is no longer required. This results in revision of the required BAMT boration volumes and the Technical Specification BAMT storage requirements.

This Supplement is applicable to St. Lucie Unit 1 only.

Revision of the BAMT Volume requirements will also result in a change to the BAMT volumes listed in the Technical Specification BASES Section 3/4.1.2. The BASES values were presented on pages 32 and 33 of the report. In the report, the text of the Bases insert used the exact BAMT boration volume, rather than the

required storage volume. The BASES text was revised to correspond to the required storage volumes, which were conservative. Since the assumption change of this calculation revises the volume adjustment between the BAMT boration volume and the required storage volume, the BASES insert will be revised.

2.0 Summary of Results

The proposed Technical Specification inputs for St. Lucie Unit 1 for Section 3.1.2.8 and BASES Section 3/4.1.2 are contained in Appendix A. The revised values supplied in Appendix A are derived in Section 3.1 and 3.2 below.

3.0 Technical Bases for Revisions

3.1 Revised BAMT Volume Requirements

As stated above, the purpose of this supplement is to document the revision of the adjustment between the BAMT boration volumes and the Technical Specification BAMT storage requirements.

In the previous revision to this report, manual operation of V2504 (the motor operated valve between the RWT and the charging pump suction) was not assumed for a postulated failure to open automatically. Since RWT water would be

unavailable through the CVCS for cooldown with V2504 closed, additional water inventory requirements were imposed on the BAMTs to allow for depressurization of the RCS down to HPSI shutoff head (1200 psia) using auxiliary spray. A volume adjustment of 1000 gallons was used, to cover the 905.9 gallons required for the depressurization (CEN-353(F), Rev.03, Page 29). The boration volumes were adjusted by rounding up to the next 50 gallons and then adding 1000 gallons to cover the depressurization volume.

Manual handwheel operation of motor operated valve V2504 is acceptable for St. Lucie Unit 1 cooldown scenarios. Revising this assumption will make the St. Lucie Unit 1 analysis agree with the Unit 2 analysis for this assumption. With manual operation of V2504, adjustment of the boration volume to include the volume for depressurization will no longer be required.

In CEN-353(F), Rev. 03, the BAMT boration volumes for each combination of BAMT and RWT concentrations was provided in Table 2-34 on page 73. These values are repeated in Table 3-1 below.

TABLE 3-1

BORIC ACID MAKEUP TANK MINIMUM BORATION VOLUMES
VS STORED BORIC ACID CONCENTRATION
FOR MODES 1, 2, 3 AND 4
MINIMUM VOLUME (GALLONS)

BAMT at wt %	RWT at 1720 ppm	RWT at 1850 ppm	RWT at 2000 ppm	RWT at 2150 ppm	RWT at 2300 ppm
2.50	8194.5	7703.9	7221.1	6714.5	6019.3
2.75	6966.8	6607.9	6129.9	5577.7	4946.8
3.00	6185.4	5689.8	5235.2	4769.9	4187.7
3.25	5406.0	5065.4	4594.0	4130.1	3650.9
3.50	4887.7	4535.6	4130.1	3713.2	3213.1

During the St. Lucie Unit 2 BACR analysis, 500 gallons were added to the BAMT boration volumes for conservatism. To be consistent with Unit 2, 500 gallons will be added to the St. Lucie Unit 1 BAMT boration volumes to define the revised Technical Specification BAMT Storage volume requirements. The boration volumes will be rounded up to the next 50 gallons, and 500 gallons will be added for conservatism. The resulting Required BAMT Storage Volumes are contained in Table 3-2 and are plotted in Figure 3-1. Figure 3-1 provides the revised storage requirements to replace Figure 2-6 on page 82 of the main report.

TABLE 3-2

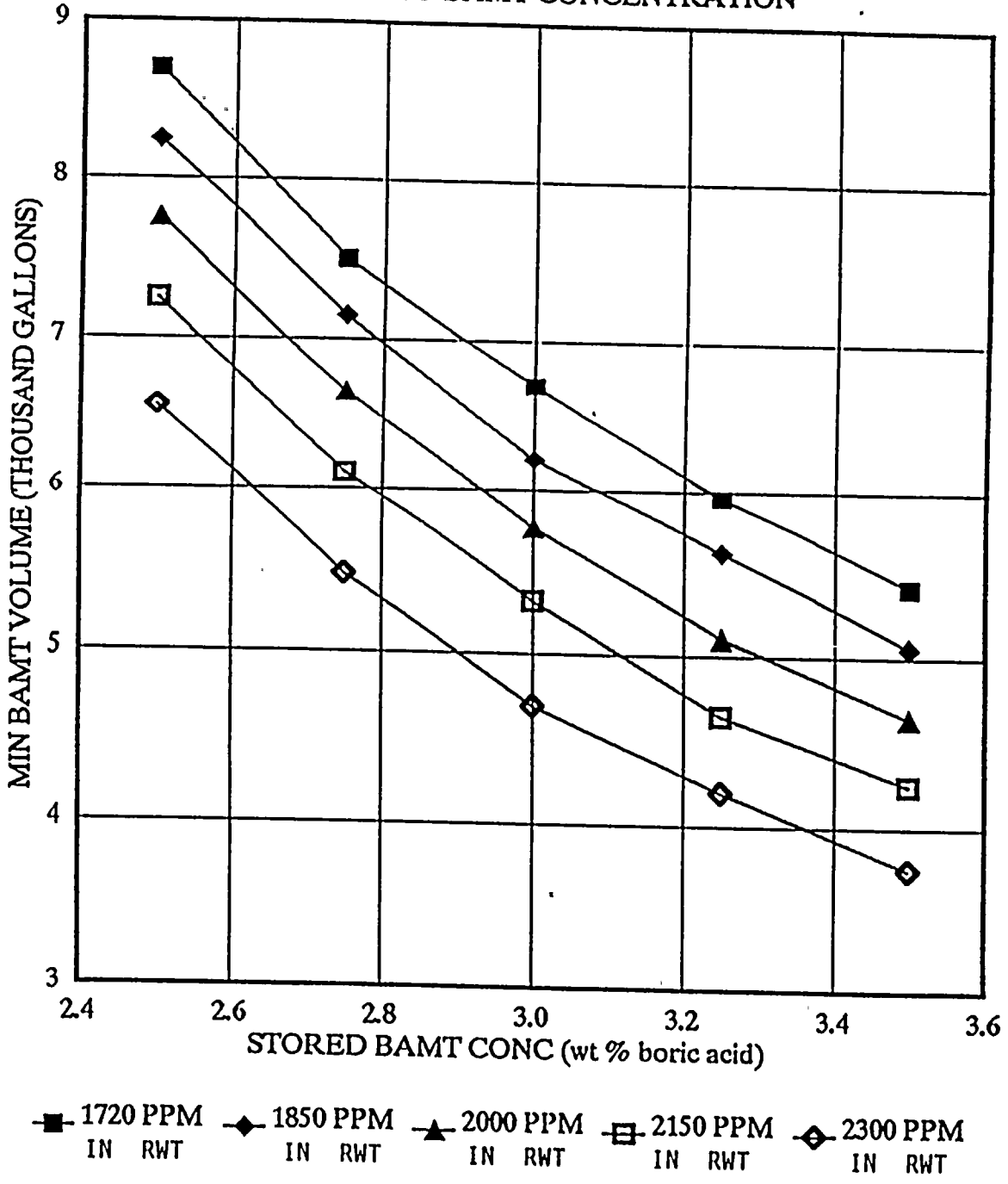
MINIMUM BORIC ACID MAKEUP TANK VOLUME VS.
STORED BORIC ACID MAKEUP TANK CONCENTRATION
MINIMUM VOLUME (GALLONS)

BAMT at wt %	RWT at 1720 ppm	RWT at 1850 ppm	RWT at 2000 ppm	RWT at 2150 ppm	RWST at 2300 ppm
2.50	8700	8250	7750	7250	6550
2.75	7500	7150	6650	6100	5450
3.00	6700	6200	5750	5300	4700
3.25	5950	5600	5100	4650	4200
3.50	5400	5050	4650	4250	3750

FP&L currently requests that only one curve be presented in the Required BAMT Volume curve, Technical Specification Figure 3.1-1, rather than the family of curves for various RWT concentrations. FP&L requests that only the curve for the RWT at 1720 ppm be provided. The new Technical Specification Figure 3.1-1 is contained in Appendix A.

Since the new Required BAMT volumes can be contained in one tank for the full range of boric acid concentrations, some of the text for Technical Specification Section 3.1.2.8 can be deleted. When the volume requirement for the full range of concentrations could not fit in one tank, the current specification required a boric acid concentration between 3.2-3.5 weight percent. The revised specification is contained in Appendix A.

FIGURE 3–1 ST.LUCIE 1 MIN BAMT VOLUME
vs STORED BAMT CONCENTRATION



3.2 Technical Specification BASES Section 3/4.1.2

The Technical Specification BASES Section 3/4.1.2 was originally presented on pages 32 and 33 of CEN-353(F), Rev.03. The purpose of that section was to determine the new BAMT and RWT volume values for the Technical Specification BASES section. The section used the BAMT boration volumes as inputs to determine the required RWT volume for the cooldown depending on the BAMT concentration used. It also determined the RWT volume required if no BAMT volume was used.

While the actual BAMT Boration Volume values were used in the section, the revised text of the BASES Section should report the BAMT Storage Volume Requirements as the volume used. Since the BAMT Storage Volume Requirements are greater, this is conservative. The BAMT Storage Volumes are used to make the BASES Section consistent with the BAMT Storage Volumes contained in Figure 3.1-1 and Technical Specification Section 3.1.2.8.

Since the Technical Specification BAMT Storage Volume Requirements were revised in Section 3.1 above, The BASES Section should be revised to correspond to the new BAMT Storage Volume Requirements. Since the BAMT Boration Volumes were used to calculate the RWT volume requirements, and the BAMT Boration Volumes have not changed, there is no need to revise the RWT volume requirements.

The revised text for the BASES Section is as follows:

"The boration capability of either system is sufficient to provide a SHUTDOWN MARGIN from all operating conditions of 2000 pcm after xenon decay and cooldown to 200 degrees F. The maximum boration capability requirement occurs at EOL from full power equilibrium xenon conditions. This requirement can be met for a range of boric acid concentrations on the Boric Acid Makeup Tanks (BAMTs) and Refueling Water Tank (RWT). This range is bounded by 5400 gallons of 3.5 weight percent (6119 ppm boron) boric acid from the BAMTs and 17,000 gallons of 1720 ppm borated water from the RWT to 8700 gallons of 2.5 weight percent (4371 ppm boron) boric acid from the BAMTs and 13,000 gallons of 1720 ppm borated water from the RWT. A minimum of 45,000 gallons of 1720 ppm boron is required from the RWT if it is to be used to borate the RCS alone."

This text is contained in Appendix A.

4.0 REFERENCES

4.1 ABB-CE Calculation 607784-MPS-1CALC-001, Revision 00, "St. Lucie Unit 1 Input to Technical Specifications 3.1.2.8 and 4.1.2.8", dated 9/25/90.

4.2 ABB-CE Calculation F-MPS-CALC-002, Rev. 00, "Input to St. Lucie Unit 1 Technical Specification System Bases", dated 9/26/91.

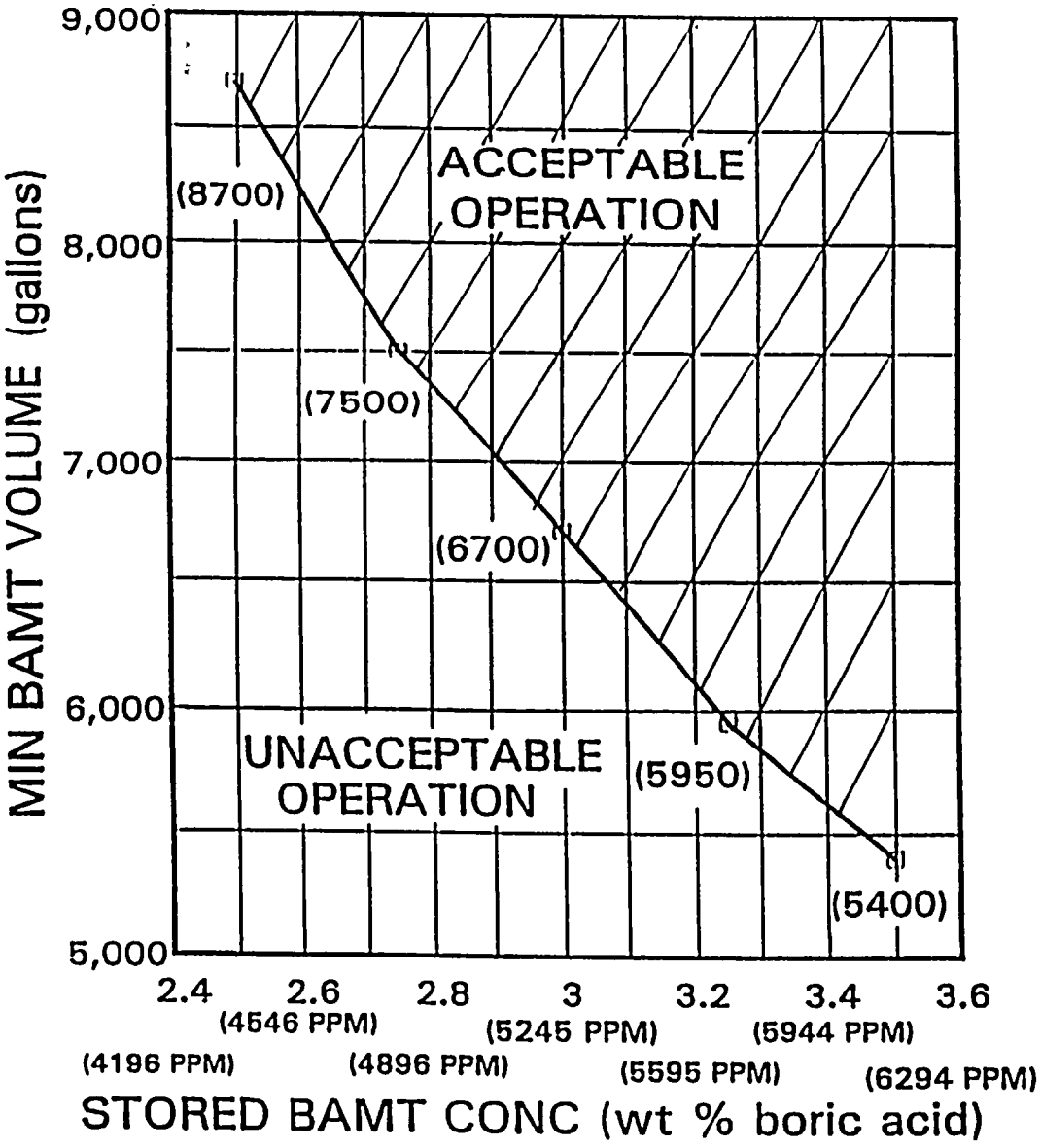
4.3 St Lucie Unit 1 Technical Specifications, through Amendment 122, dated 5/03/93.

4.4 ABB-CE Calculation F-MECH-CALC-016, Rev. 00, "FP&L St. Lucie 1 Revision of Technical Specification Section 3.1.2.8 and BASES 3/4.1.2", dated 10/21/93.

APPENDIX A

Technical Specification Input for St. Lucie Unit 1

FIGURE 3.1-1 ST. LUCIE 1 MIN BAMT VOLUME VS STORED BAMT CONCENTRATION



ST. LUCIE - UNIT 1 3/4 1-17

REACTIVITY CONTROL SYSTEMS

BORATED WATER SOURCES - OPERATING

LIMITING CONDITION FOR OPERATION

3.1.2.3 At least two of the following four borated water sources shall be OPERABLE:

a. Boric Acid Makeup Tank 1A in accordance with Figure 3.1-1, ~~and in the range of 3.2 to 3.5 weight percent boric acid (5595 to 6119 ppm boron),~~

b. Boric Acid Makeup Tank 1B in accordance with Figure 3.1-1, ~~and in the range of 3.2 to 3.5 weight percent boric acid (5595 to 6119 ppm boron),~~

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

d. The refueling water tank with:

1. A minimum contained volume of 401,800 gallons of water,

2. A minimum boron concentration of 1720 ppm,

3. A maximum solution temperature of 100°F,

4. A minimum solution temperature of 55°F when in MODES 1 and 2, and

5. A minimum solution temperature of 40°F when in MODES 3 and 4.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

With only one borated water source OPERABLE, restore at least two borated water sources to OPERABLE status within 72 hours or make the reactor subcritical within the next 2 hours and borate to a SHUTDOWN MARGIN equivalent to at least 2000 pcm at 200°F; restore at least two borated water sources to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.

SURVEILLANCE REQUIREMENTS

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

a. At least once per 7 days by:

1. Verifying the boron concentration in each water source,

REACTIVITY CONTROL SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

2. Verifying the water level in each water source.

b. At least once per 24 hours by verifying the RWT temperature.

c. At least once per 24 hours by verifying that the Boric Acid Makeup Tank solution temperature is greater than 55°F when the Reactor Auxiliary Building air temperature is below 55°F.

REACTIVITY CONTROL SYSTEMS

BASES

3/4.1.1.5 MINIMUM TEMPERATURE FOR CRITICALITY

The MTC is expected to be slightly negative at operating conditions. However, at the beginning of the fuel cycle, the MTC may be slightly positive at operating conditions and since it will become more positive at lower temperatures, this specification is provided to restrict reactor operation when T_{avg} is significantly below the normal operating 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 pumps, and 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 all operating conditions of 2000 pcm after xenon decay and cooldown to 200°F. The maximum boration capability requirement occurs at EOL from full power equilibrium xenon conditions. This requirement can be met for a range of boric acid concentrations in the Boric Acid Makeup Tanks (BAMTs) and Refueling Water Tank (RWT). This range is bounded by ~~8350~~ 5400 gallons of 3.5 weight percent (6119 ppm boron) boric acid from the BAMTs and ~~14,000~~ 17,000 gallons of 1720 ppm borated water from the RWT to ~~13,300~~ 8700 gallons of 2.5 weight percent (4371 ppm boron) boric acid from the BAMTs and ~~9,000~~ 13,000 gallons of 1720 ppm borated water from the RWT. A minimum of 45,000 gallons of 1720 ppm boron is required from the RWT if it is to be used to borate the RCS alone.

The requirements for a minimum contained volume of 401,800 gallons of borated water in the refueling water tank ensures the capability for borating the RCS to the desired level. The specified quantity of borated water is consistent with the ECCS requirements of Specification 3.5.4. Therefore, the larger volume of borated water is specified here too.

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 change in the event the single injection system becomes inoperable.