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November 30, 2000

2CAN110002

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

Arkansas Nuclear One – Unit 2
Docket No. 50-368
License No. NPF-6
Technical Specification Change Request for the Boric Acid Makeup Tank

Gentlemen:

Attached for your review and approval are proposed changes to the Arkansas Nuclear One, Unit 2 (ANO-2) Technical Specifications (TS). The proposed changes affect the Limiting Condition for Operation, Surveillance Requirements and Bases associated with the Boric Acid Makeup Tanks (BAMT), Boric Acid Makeup pumps, and Charging pumps, TS Section 3/4.1.2. The requirements for these components are being proposed for relocation from the current ANO-2 TS to the ANO-2 Technical Requirements Manual (TRM).

The ANO-2 Safety Analysis Report (SAR) Chapter 15 events have been reviewed to determine if the Boration Systems contained in section 3/4.1.2 are required to mitigate any of these events. These evaluations concluded that the BAMTs, Boric Acid pumps, and Charging pumps provide a backup safety function, however, are not credited in the mitigation or prevention of any accidents and therefore, do not meet the criteria set forth in 10 CFR 50.36 (c) (2) (ii) for inclusion in the TSs.

As part of the preparation and evaluation of the proposed ANO-2 power uprate, it has been determined that the boron concentration contained in the BAMTs must be increased. This would result in changes to TS 3.1.2.7, 3.1.2.8, and Figure 3.1-1. The changes relating to the increased boron concentration will be discussed in the 2R15 Power Uprate License Amendment request being provided to the NRC in the near future. Following approval of this request to relocate TS Section 3/4.1.2 to the TRM and the approval of the power uprate submittal, the changes that are described in the power uprate submittal related to TS 3.1.2.7, 3.1.2.8, and Figure 3.1-1 will be made to the associated TRM in accordance with 10CFR50.59.

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The proposed change has been evaluated in accordance with 10CFR50.91(a)(1) using criteria in 10CFR50.92(c) and it has been determined that this change involves no significant hazards considerations. The bases for these determinations are included in the attached submittal.

Entergy Operations requests that the effective date for this TS change to be within 60 days of approval. Although this request is neither exigent nor emergency, your prompt review is requested.

I declare under penalty of perjury that the foregoing is true and correct. Executed on November 30, 2000.

Very truly yours,

C. G. Anderson
Vice President, Operations
Arkansas Nuclear One

CGA/dm
Attachments

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ATTACHMENT

TO

2CAN110002

PROPOSED TECHNICAL SPECIFICATION

AND

RESPECTIVE SAFETY ANALYSES

IN THE MATTER OF AMENDING

LICENSE NO. NPF-6

ENTERGY OPERATIONS, INC.

DOCKET NO. 50-368

DESCRIPTION OF PROPOSED CHANGES

The proposed changes to the Arkansas Nuclear One, Unit 2 (ANO-2) Technical Specifications (TS) are desired to eliminate unnecessary burden on Entergy Operations, Inc, and the NRC associated with future revisions to the boration system specifications and to establish consistency with the requirements of 10 CFR 50.36 (c) (2) (ii). Additionally, Standard Technical Specifications Combustion Engineering Plants (NUREG-1432) does not contain these specifications and therefore, this change is consistent with NUREG-1432. Entergy does note that in NUREG-1432, the charging pumps are described in the bases as a subsystem of the Emergency Core Cooling System (ECCS). However, ANO-2 does not consider the Charging pumps an ECCS subsystem and they are not credited in accident mitigation or prevention.

This change proposes that the boration systems contained in TS Section 3/4.1.2, with their Limiting Condition for Operation, associated Actions, Surveillance Requirements, Figures, and Bases be relocated to the Technical Requirements Manual (TRM). No change to these specifications other than the relocation is proposed in this request.

The boron injection system ensures that negative reactivity control is available during each mode of 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, and 5) an emergency power supply from operable diesel generators. The systems will be maintained and available to meet their safety function even when relocated to the TRM.

BACKGROUND

Technical Specifications

Each TS that is proposed for relocation to the TRM is briefly outlined in the following paragraphs. There will be no changes to these TSs

TS 3.1.2.1 requires in Modes 5 & 6 that at least one boration flow path to the Reactor Coolant System (RCS) be operable. The flow path may be from either the Boric Acid Makeup Tank (BAMT) or the Refueling Water Tank (RWT) via pumps or gravity feed connections.

Depending on the volume available in the BAMTs as compared to the concentration of boric acid stored in the BAMTs and RWT, TS 3.1.2.2.requires in Modes 1, 2, 3, and 4 that a specified number of boron injection flow paths to the RCS be operable. TS Figure 3.1-1, which will also be relocated to the TRM, specifies the minimum boric acid volume contained in a given tank are acceptable.

TS 3.1.2.3 requires in Modes 5 and 6 that at least one charging pump in the boron injection flow path pursuant to Specification 3.1.2.1 to be operable and capable of being powered from an operable emergency bus.

TS 3.1.2.4 requires in Modes 1, 2, 3, and 4 that at least two charging pumps to be operable.

TS 3.1.2.5 requires in Modes 5 and 6 that at least one boric acid makeup pump to be operable and capable of being powered from an operable emergency bus if only the flow path through the boric acid makeup pump in Specification 3.1.2.1 is operable.

TS 3.1.2.6 requires in Modes 1, 2, 3, and 4 that at least the boric acid makeup pump(s) in the boron injection flow path(s) required pursuant to Specification 3.1.2.2 to be operable. Additionally, the boric acid makeup pump must be capable of being powered from an operable emergency bus if the flow path through the boric acid makeup pump(s) in Specification 3.1.2.2 is operable.

TS 3.1.2.7 requires in Mode 5 and 6 that at least one borated water source be operable. Either the BAMT or the RWT with the specified volume, boric acid concentrations, and minimum solution temperature provide this source.

In Modes 1, 2, 3, and 4 TS 3.1.2.8 requires that two borated water sources to be operable. The RWT and at least one BAMT with the specified volume, boric acid concentrations, and minimum solution temperature meet this requirement.

Previous Change to the Boration Flow Path in Amendment 82 to the OL

The NRC approved Amendment 82 to the ANO-2 Operating License on March 11, 1988. This amendment changed the boron concentration contained in the RWT, Safety Injection Tanks (SITs) and BAMTs. The concentration in the RWT and SITs was increased while the concentration in the BAMTs was decreased. The SAR Chapter 15 events as well as long term boric acid buildup calculations and post Loss Of Coolant Accident (LOCA) containment pH values reported in SAR Chapter 6 were evaluated for impact by the increase in the concentration in the SITs and RWT. The decrease of boric acid concentration in the BAMTs did not require a re-evaluation of the SAR Chapter 15 events since addition of borated water from the BAMTs to the RCS for reactivity control was not credited in any of these events.

The original cooldown without letdown analysis assumed that all the boron necessary to achieve the required shutdown margin (SDM) during the cooldown was provided by the BAMT during the initial stages of the event. The re-analysis also credits the boron concentration of the RWT thereby allowing the total boron inventory of the BAMTs to be reduced. Since the new analysis included a detailed evaluation of shutdown margin requirements, which are satisfied throughout the event, the staff found it acceptable to credit both the BAMT and RWT borated water sources. The relocation of the BAMT boric

acid concentration requirements to the TRM will not prevent maintaining the SDM requirements during a plant cooldown. The boron concentration contained in the BAMT will continue to be evaluated in relationship to its use in maintaining SDM requirements during a plant cooldown.

The effect of the change in boron concentration on the post LOCA containment pH reported in SAR Chapter 6 was also evaluated in this Amendment. In future changes, since BAMT is not a credited source of boric acid injection in any of the SAR Chapter 15 events, the relocation of the BAMT requirements to the TRM should not impact the Chapter 6 containment pH calculations.

System Description

The Boric Acid Makeup Tanks, Boric Acid Makeup pumps, and Charging Pumps are part of the Chemical and Volume Control System (CVCS). The CVCS functions to maintain RCS inventory and control RCS chemistry. The BAMTs and the RWT provide sources of boric acid solution for injection into the RCS. The BAMTs also supply a source of boric acid makeup to the Spent Fuel Pool (SFP) and the RWT. Neither the Charging nor the Boric Acid Makeup pumps are considered "Q:" components. The combination of the BAMTs and the RWT contain sufficient boric acid to bring the plant to a cold shutdown condition as well as ensure that negative reactivity control is available during each mode of operation.

There are two BAMTs each with a separate Boric Acid Makeup pump and gravity feed valve. The flow path from the BAMT to the RCS may be through either the Boric Acid Makeup pump to suction of the Charging pumps or through a gravity feed valve to the suction of the Charging pumps. The two separate flow paths from the discharge of the Boric Acid Makeup pumps or gravity feed valves combine into a common header at the suction of the Charging pumps. The boric acid then is discharged to the RCS via the Charging pumps. The Boric Acid pumps, gravity feed valves and charging pumps receive a SIAS when RCS pressure drops or Containment Building pressure increases to a their specified TS values. This aligns the system components such that boric acid can be injected into the RCS. Although the boration subsystems provide a means of reactivity control through boron injection, none of these systems are taken credit for in any design bases accident analysis or transient analysis.

Chapter 15 Accident Analysis Review

Shutdown margin is defined as the instantaneous amount of reactivity by which the reactor is subcritical or would be subcritical from its present condition assuming all control element assemblies (CEA) are fully inserted except for the single assembly of highest reactivity worth which is assumed to be fully withdrawn. In the event of an uncontrolled CEA withdrawal from a subcritical or a critical condition, shutdown margin is assured by the insertion of the CEAs, assuming a single assembly of highest reactivity worth remains

withdrawn, and the present soluble boron concentration in the core (i.e., no additional boron injected). See SAR Section 15.1.1 and 15.1.2.

The CVCS regulates both the chemistry and the quantity of coolant in the RCS. Changing the boron concentration in the RCS is a part of normal plant operation, compensating for long-term reactivity effects, such as fuel burnup, xenon buildup and decay, and plant cooldown. Boron dilution is a manual operation conducted under strict procedural controls, which specify permissible limits on the rate and magnitude of any required change in boron concentration. Boron concentration in the RCS can be decreased either by controlled addition of unborated makeup water, with a corresponding removal of reactor coolant (feed and bleed), or by using one of the letdown ion exchangers. The letdown ion exchangers are used for boron removal when the boron concentration is low (<30ppm), since the feed-and-bleed method becomes inefficient at low concentrations. The addition of unborated water to the RCS is accomplished by starting a Reactor Makeup Water pump and aligning its associated automatic outlet valve to the VCT. During normal operations the charging pumps take suction from the VCT. With the addition of unborated water into the VCT the boron concentration of the water injected back into the RCS via the Charging pumps is reduced thereby causing a reduction in the overall boron concentration of the RCS. A boron dilution event could occur if an uncontrolled injection of unborated water were to occur via the described path. Upon recognition by the operators, closing the Reactor Makeup Water pump outlet valve and securing the Reactor Makeup Water pump terminates the event. Boron injection is not credited in the mitigation of this accident. Although boron injection may be desirable to regain SDM, it is not primary success path for mitigating the boron dilution event. See SAR Section 15.1.4.

In the steam line rupture event boron injection is assumed to assist in terminating the return to power after the steam generator is empty. The injection of boron is via a High Pressure Safety Injection (HPSI) pump taking suction from the RWT. This boron injection flow path will remain in the TS. TS 3.5.4 requires that the RWT be operable in Mode 1, 2, 3, and 4 and TS 3.5.2 requires that two independent HPSI pumps be operable in Mode 1, 2, or 3 when pressurizer pressure is greater than or equal to 1700 psia. Therefore, the proposed movement of the boration flow path specifications to the TRM does not affect the assumptions used in terminating the return to power that would occur after a steam line rupture event.

During a small or large break LOCA boron injection is assumed via the ECCS which includes the High Pressure Safety Injection pumps and Low Pressure Safety Injection pumps. No credit is taken for the operation of the Charging pumps or the injection of boric acid from the BAMT in the small break or large break LOCA analysis.

Plant Cooldown Using Charging System

The charging system is analyzed in the ANO-2 SAR Section 9.3.4.4.1 for its ability to place the unit on shutdown cooling without letdown being available. Additionally, the boric acid

concentration contained in the BAMT and the RWT is evaluated to assure shutdown margin requirements can be maintained during a plant cooldown. The relocation of the charging pump specifications to the TRM will not change the ability of the charging system to perform this function. Additionally the boric acid concentration contained in the BAMTs and RWT will continue to be evaluated to assure shutdown requirements during plant cooldown will be satisfied. In the event the charging system or BAMT is not available for use during a plant cooldown, a slow cooldown and depressurization of the RCS can be accomplished to allow the use of the High Pressure Safety Injection pump.

BASIS FOR PROPOSED CHANGE

The proposed change contained in this submittal relocates TS 3.1.2.1, 3.1.2.2, 3.4.2.3, 3.1.2.4, 3.1.2.5, 3.1.2.6, 3.1.2.7, and 3.1.2.8 (Section 3/4.1.2) to the TRM. No change to any of these specifications is proposed other than the relocation to the TRM. Standard Technical Specifications Combustion Engineering Plants (NUREG-1432) does not contain any of these specifications. Therefore, this change is consistent with NUREG-1432.

In addition, 10CFR50.36, Technical Specifications, lists four criteria that require the establishment of a Limiting Condition for Operation. The following provides comparison of these four criteria with the basis for the BAMTs, Boric Acid Makeup pumps and charging pumps.

Criterion 1 - Installed instrumentation that is used to detect, and indicate in the control room, a significant abnormal degradation of the reactor coolant pressure boundary. The boration systems do not provide control room instrumentation that is used to detect a significant degradation of the reactor coolant pressure boundary.

Criterion 2 - A process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier. The boration systems contained in TS Section 3/4.1.2 are not contributors in accident initiation.

Criterion 3. A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier. Based on review of the SAR Chapter 15 events, the boration systems contained in TS Section 3/4.1.2 were not credited in any design basis accident or transient analysis

Criterion 4. A structure, system, or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety. The boration systems contained in TS Section 3/4.1.2 will remain functional and continue to meet their design requirements. They are not credited in the initiation or mitigation of any design basis

accidents and therefore, do not have operating experience shown to be significant to public health and safety.

Neither the Technical Specifications nor surveillance requirements for the BAMTs, Boric Acid Makeup pumps, Charging pumps or their associated flow paths fall into any of these categories. Therefore, the relocation of these specifications is acceptable.

During a small or large break LOCA boron injection is assumed via the ECCS which includes the HPSI and LPSI pumps. The suction source for these pumps is the Refueling Water Tank. No credit is taken for the operation of the Charging pumps or the injection of boric acid from the BAMT in the small break or large break LOCA analysis. The concentration, volume, and temperature of boric acid contained in the RWT are contained in ANO-2 TS 3.5.4. This specification will not be relocated to the TRM.

The proposed change allows the relocation of these specifications to the TRM. No change other than the relocation to the TRM is proposed. Future changes to any of these will be controlled under the ANO-2 50.59 program. System design and function of the associated components will continue to be maintained.

DETERMINATION OF NO SIGNIFICANT HAZARDS CONSIDERATION

Energy Operations, Inc. is proposing that the Arkansas Nuclear One, Unit 2 (ANO-2) Operating License be amended to remove Technical Specifications (TS) 3.1.2.1, 3.1.2.2, 3.1.2.3, 3.1.2.4, 3.1.2.5, 3.1.2.6, 3.1.2.7, 3.1.2.8, and Figure 3.1-1 from the ANO-2 TS and relocate them to the ANO-2 Technical Requirements Manual (TRM).

The Boration Systems contained in these specifications include the Boric Acid Makeup Pumps, the Boric Acid Makeup Tank (BAMT), the Refueling Water Tank (RWT), and the Charging pumps. These components are part of the Chemical And Volume Control System (CVCS). The CVCS functions to maintain Reactor Coolant System (RCS) inventory and control RCS chemistry. The BAMTs and RWT provide sources of boric acid solution for injection into the RCS.

There are two BAMTs each with a separate Boric Acid Makeup pump and gravity feed valve. The flow path from the BAMT to the RCS may be through either the Boric Acid Makeup pump to suction of the Charging pumps or through a gravity feed valve to the suction of the Charging pumps. The two separate flow paths from the discharge of the Boric Acid Makeup pumps or gravity feed valves combine into a common header at the suction of the charging pumps. The boric acid then is discharged to the RCS via the charging pumps. The Boric Acid pumps, gravity feed valves and charging pumps receive a Safety Injection Actuation Signal (SIAS) when RCS pressure drops or Containment Building pressure increases to a their specified TS values. This aligns the system components such that boric acid can be injected into the RCS. Although the boration

subsystems provide a means of reactivity control through boron injection, none of these systems are taken credit for in any design bases accident analysis or transient analysis.

An evaluation of the proposed change has been performed in accordance with 10CFR50.91(a)(1) regarding no significant hazards considerations using the standards in 10CFR50.92(c). A discussion of these standards as they relate to this amendment request follows:

1. **Will operation of the facility in accordance with this proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?**

   The boration systems, BAMT, Boric Acid Makeup Pumps, and Charging Pumps, are part of the CVCS, which functions to maintain Reactor Coolant System inventory and chemistry. The boration system functions will continue to be maintained in accordance with their associated design requirements. During accident conditions when a boration source is required for accident mitigation, the RWT provides suction for the High Pressure Safety Injection (HPSI) and Low Pressure Safety Injection (LPSI) pumps. The CVCS boration systems are not credited in the mitigation of any accidents. Therefore, the dose consequences associated with accident analysis will be unchanged. The HPSI, LPSI pumps and RWT are required by Technical Specifications.

   Based on an evaluation of the criterion listed in 10 CFR 50.36 (c) (2) (ii), the relocation of the CVCS boration systems to the TRM is acceptable. No changes will be made to these systems that will affect their current operation.

   Therefore, this change does <u>not</u> involve a significant increase in the probability of consequences of any accident previously evaluated.

2. **Will operation of the facility in accordance with this proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?**

   The design and functions of the Boric Acid Makeup Tanks, Boric Acid Makeup Pumps, Charging Pumps and associated flow paths will continue to be maintained. These systems are not accident initiators. Because the proposed amendment will not change the design, configuration or method of operation of the plant, it will not create the possibility of a new or different kind of accident.

   Safety Analysis Report (SAR) Chapter 15 provides the analysis of accidents that are considered credible. The Uncontrolled Control Element Assemblies (CEA) withdrawal from a subcritical or a critical condition, Boration Dilution Event, and Loss of Coolant Accident (LOCA) were evaluated in relationship to relocating these

specifications to the TRM. Boric acid injection via the CVCS system was not credited in mitigating any of these accidents.

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

3. **Will operation of the facility in accordance with this proposed change involve a significant reduction in a margin of safety?**

The movement of these TSs to the TRM does not reduce the existing TSs or surveillance requirements. The proposed change does not change the design function for any of these components. Additionally, none of the boration systems contained in these specifications are credited in any accident analysis. The systems are used to maintain RCS chemistry and inventory and this function will be maintained.

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

Therefore, based on the reasoning presented above and the previous discussion of the amendment request, Entergy Operations has determined that the requested change does not involve a significant hazards consideration.

ENVIRONMENTAL IMPACT EVALUATION

Pursuant to 10CFR51.22(b), an evaluation of the proposed amendment has been performed to determine whether or not it meets the criteria for categorical exclusion set forth in 10CFR 51.22 (c) (9) of the regulations. The basis for this determination is as follows:

1. The proposed license amendment does not involve a significant hazards consideration as described previously in the evaluation.

2. As discussed in the significant hazards evaluation, this change does not result in a significant change or significant increase in the radiological doses for any Design Basis Accident. The proposed license amendment does not result in a significant change in the types or a significant increase in the amounts of any effluents that may be released off-site.

3. The proposed license amendment does not result in a significant increase to the individual or cumulative occupational radiation exposure because this change does not in any way result in the modification or design function of the existing components.

PROPOSED ANO-2 TECHNICAL SPECIFICATION CHANGES

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MINIMUM TEMPERATURE FOR CRITICALITY

LIMITING CONDITION FOR OPERATION

3.1.1.5 The Reactor Coolant System lowest operating loop temperature (T_{avg}) shall be ≥525°F when the reactor is critical.

APPLICABILITY: MODES 1 and 2#*.

ACTION:

With a Reactor Coolant System operating loop temperature (T_{avg}) <525°F, restore T_{avg} to within its limit within 15 minutes or be in HOT STANDBY within the next 15 minutes.

SURVEILLANCE REQUIREMENTS

4.1.1.5 The Reactor Coolant System temperature (T_{avg}) shall be determined to be ≥525°F:

a. Within 15 minutes prior to achieving reactor criticality, and

b. At least once per 30 minutes when the reactor is critical and the Reactor Coolant System T_{avg} is less than 535°F.

#With K_{eff} ≥1.0.

*See Special Test Exception 3.10.5.

MARKUP OF CURRENT TECHNICAL SPECIFICATIONS

(For Information Only)

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REACTIVITY CONTROL SYSTEMS

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 shall be OPERABLE:

a. A flow path from the boric acid makeup tank via either a boric acid makeup pump or a gravity feed connection and 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, suspend all operations involving CORE ALTERATIONS or positive reactivity changes until at least one injection path is restored to OPERABLE status.

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 flow path from the discharge of the boric acid makeup tank to the suction of the charging pump is above 55°F when a flow path from the boric acid makeup tanks is used.

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.

REACTIVITY CONTROL SYSTEMS

FLOW PATHS - OPERATING

LIMITING CONDITION FOR OPERATION

3.1.2.2 The following boron injection flow paths shall be OPERABLE, depending on the volume available in the boric acid makeup tanks.

a. If the contents of ONE boric acid makeup tank meet the volume requirements of Figure 3.1-1, two of the following three flow paths to the Reactor Coolant System shall be OPERABLE:

1. One flow path from the appropriate boric acid makeup tank via a boric acid makeup pump and a charging pump.

2. One flow path from the appropriate boric acid makeup tank via a gravity feed connection and a charging pump.

3. One flow path from the refueling water tank via a charging pump.

OR

b. If the contents of Both boric acid tanks are needed to meet the volume requirements of Figure 3.1-1, four of the following five flow paths to the Reactor Coolant System shall be OPERABLE:

1. One flow path from boric acid makeup tank A via a boric acid makeup pump and a charging pump.

2. One flow path from boric acid makeup tank B via a boric acid makeup pump and a charging pump.

3. One flow path from boric acid makeup tank A via a gravity feed connection and a charging pump.

4. One flow path from boric acid makeup tank B via a gravity feed connection and a charging pump.

5. One flow path from the refueling water tank via a charging pump.

APPLICABILITY: MODES 1, 2, 3 and 4

ACTION:

With any of the boron injection flow paths to the Reactor Coolant System required in (a) or (b) above inoperable, restore the inoperable flow path 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 that specified in the CORE OPERATING LIMITS REPORT at 200°F within the next 6 hours; restore the 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 The above required flow paths shall be demonstrated OPERABLE:~~

~~a. At least once per 7 days by verifying that the temperature of the flow path from the discharge of the boric acid makeup tank(s) to the suction of the charging pumps is above 55"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 during shutdown by verifying that each actuated valve in the flow path actuates to its correct position on a SIAS test signal.~~

~~REACTIVITY CONTROL SYSTEMS~~

~~CHARGING PUMP - SHUTDOWN~~

~~LIMITING CONDITION FOR OPERATION~~

~~3.1.2.3 At least one charging pump in the boron injection flow path required OPERABLE pursuant to Specification 3.1.2.1 shall be OPERABLE and capable of being powered from an OPERABLE emergency bus.~~

~~APPLICABILITY: MODES 5 and 6.~~

~~ACTION:~~

~~With no charging pump OPERABLE, suspend all operations involving CORE ALTERATIONS or positive reactivity changes until at least one of the required pumps is restored to OPERABLE status.~~

~~SURVEILLANCE REQUIREMENTS~~

~~4.1.2.3 No additional Surveillance Requirements other than those required by Specification 4.0.5.~~

~~REACTIVITY CONTROL SYSTEMS~~

~~CHARGING PUMPS - OPERATING~~

~~LIMITING CONDITION FOR OPERATION~~

~~3.1.2.4 At least two charging pumps shall be OPERABLE.~~

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

~~ACTION:~~

~~With only one charging pump OPERABLE, restore at least two charging pumps to OPERABLE status within 72 hours or be in at least HOT STANDBY and borated to a SHUTDOWN MARGIN equivalent to at least that specified in the CORE OPERATING LIMITS REPORT at 200°F within the next 6 hours; restore at least two charging pumps to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.~~

~~SURVEILLANCE REQUIREMENTS~~

~~4.1.2.4 No additional Surveillance Requirements other than those required by Specification 4.0.5.~~

~~REACTIVITY CONTROL SYSTEMS~~

~~BORIC ACID MAKEUP PUMPS - SHUTDOWN~~

~~LIMITING CONDITION FOR OPERATION~~

~~3.1.2.5 At least one boric acid makeup pump shall be OPERABLE and capable of being powered from an OPERABLE emergency bus if only the flow path through the boric acid makeup pump in Specification 3.1.2.1a above, is OPERABLE.~~

~~APPLICABILITY: MODES 5 and 6.~~

~~ACTION:~~

~~With no boric acid makeup pump OPERABLE as required to complete the flow path of Specification 3.1.2.1a, suspend all operations involving CORE ALTERATIONS or positive reactivity changes until at least one boric acid makeup pump is restored to OPERABLE status.~~

~~SURVEILLANCE REQUIREMENTS~~

~~4.1.2.5 No additional Surveillance Requirements other than those required by Specification 4.0.5.~~

REACTIVITY CONTROL SYSTEMS

BORIC ACID MAKEUP PUMPS - OPERATING

LIMITING CONDITION FOR OPERATION

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 makeup pump(s) in Specification 3.1.2.2 is OPERABLE.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

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 that specified in the CORE OPERATING LIMITS REPORT at 200°F; restore the above required boric acid 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 No additional Surveillance Requirements other than those required by Specification 4.0.5.

REACTIVITY CONTROL SYSTEMS

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 with:

1. A minimum contained borated water volume of 3,400 gallons (equivalent to 31% of indicated tank level),

2. A boric acid concentration between 2.5 WT% and 3.5 WT%, and

3. A minimum solution temperature of 55°F.

b. The refueling water tank with:

1. A minimum contained borated water volume of 61,370 gallons (equivalent to 7.5% of indicated tank level),

2. A minimum boron concentration of 2500 ppm, and

3. A minimum solution temperature of 40°F.

APPLICABILITY: MODES 5 and 6.

ACTION:

With no borated water sources OPERABLE, suspend all operations involving CORE ALTERATIONS or positive reactivity changes until at least one borated water source is restored to OPERABLE status.

SURVEILLANCE REQUIREMENTS

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

a. At least once per 7 days by:

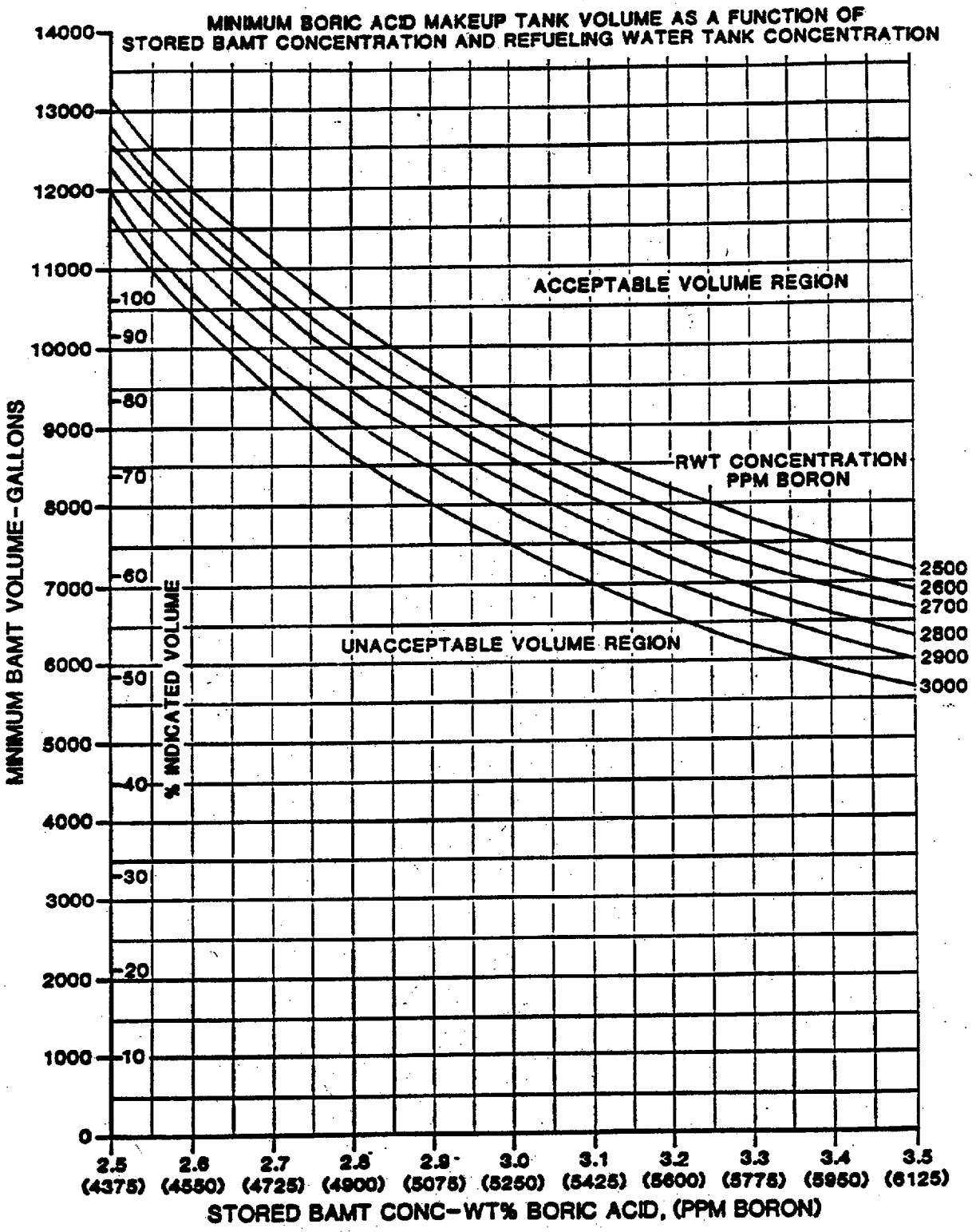
1. Verifying the boron concentration of the water,

2. Verifying the contained borated water volume of the tank, and

3. Verifying the boric acid makeup tank solution temperature is greater than 55°F

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 $\leq$ 40°F.

~~Figure 3.1-1~~


MINIMUM BORIC ACID MAKEUP TANK VOLUME AS A FUNCTION OF
STORED BAMT CONCENTRATION AND REFUELING WATER TANK CONCENTRATION
MINIMUM BAMT VOLUME-GALLONS
% INDICATED VOLUME
ACCEPTABLE VOLUME REGION
UNACCEPTABLE VOLUME REGION
RWT CONCENTRATION
PPM BORON
2500
2600
2700
2800
2900
3000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
100
90
80
70
60
50
40
30
20
10
2.5 (4375)
2.6 (4550)
2.7 (4725)
2.8 (4900)
2.9 (5075)
3.0 (5250)
3.1 (5425)
3.2 (5600)
3.3 (5775)
3.4 (5950)
3.5 (6125)
STORED BAMT CONC-WT% BORIC ACID, (PPM BORON)

REACTIVITY CONTROL SYSTEMS

BORATED WATER SOURCES - OPERATING

LIMITING CONDITION FOR OPERATION

3.1.2.8 Each of the following borated water sources shall be OPERABLE:

a. At least one of the following sources with a minimum solution temperature of 55°F.

1. One boric acid makeup tank, with the tank contents in accordance with Figure 3.1-1, or

2. Two boric makeup tanks, with the combined contents of the tanks in accordance with Figure 3.1-1, and

b. The refueling water tank with:

1. A contained borated water volume of between 464,900 and 500,500 gallons (equivalent to an indicated tank level of between 91.7% and 100%, respectively),

2. Between 2500 and 3000 ppm of boron,

3. A minimum solution temperature of 40°F, and

4. A maximum solution temperature of 110°F.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With the above required boric acid makeup tank(s) inoperable, restore the make up 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 that specified in the CORE OPERATING LIMITS REPORT 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 one 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 Each of the above required borated water sources shall be demonstrated OPERABLE:

~~REACTIVITY CONTROL SYSTEMS~~

~~SURVEILLANCE REQUIREMENTS (Continued)~~

~~a. At least once per 7 days by:~~

~~1. Verifying the boron concentration in each water source,~~

~~2. Verifying the contained borated water volume in each water source, and~~

~~3. Verifying the boric acid makeup tank(s) solution temperature is greater than 55°F.~~

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

MARKUP OF TECHNICAL SPECIFICATION BASES

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 525°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 operations. 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) 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 that specified in the CORE OPERATING LIMITS REPORT 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 and a small fraction of the borated water from the refueling water tank required in Specification 3.1.2.8.~~

~~The requirement in Technical Specification 3.1.2.8 for a minimum contained volume of 464,900 gallons of 2500-3000 ppm borated water in the refueling water tank ensures the capability for borating the RCS to the desired concentration. The value listed is consistent with the plant ECCS requirements.~~

~~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.~~

~~The boron capability required below 200°F is based upon providing a sufficient SHUTDOWN MARGIN after xenon decay and cooldown from 200°F to 140°F. This condition requires either borated water from the refueling water tank or boric acid solution from the boric acid makeup tank(s) in accordance with the requirements of Specification 3.1.2.7.~~

~~The contained water volume limits includes allowance for water not available because of discharge line location and other physical characteristics. The 61,370 gallon limit for the refueling water tank is based upon having an indicated level in the tank of at least 7.5%.~~

~~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 boric acid sources, when mixed with the trisodium phosphate, ensures a long term pH value of ≥ 7.0 for the solution recirculated within containment after a LOCA. This pH limit minimizes the evolution of iodine and helps to inhibit stress corrosion cracking of austenitic stainless steel components in containment during the recirculation phase following an accident.~~

3/4.1.3 MOVABLE CONTROL ASSEMBLIES

The specifications of this section ensure that (1) acceptable power distribution limits are maintained, (2) the minimum SHUTDOWN MARGIN is maintained, and (3) the potential effects of CEA misalignments are limited to acceptable levels.

The ACTION statements which permit limited variations from the basic requirements are accompanied by additional restrictions which ensure that the original design criteria are met.

The ACTION statements applicable to a stuck or untrippable CEA or a large misalignment (≥ 19 inches) of two or more CEAs, require a prompt shutdown of the reactor since either of these conditions may be indicative of a possible loss of mechanical functional capability of the CEAs and in the event of a stuck or untrippable CEA, the loss of SHUTDOWN MARGIN. CEAs that are confirmed to be inoperable due to problems other than addressed by ACTION a of Specification 3.1.3.1 will not impact SHUTDOWN MARGIN as long as their relative positions satisfy the applicable alignment requirements.

For small misalignments (< 19 inches) of the CEAs, there is 1) a small effect on the time dependent long term power distributions relative to those used in generating LCOs and LSSS setpoints, 2) a small effect on the available SHUTDOWN MARGIN, and 3) a small effect on the ejected CEA worth used in the safety analysis. Therefore, the ACTION