Omaha Public Power District

444 South 16th Street Mall
Omaha NE 68102-2247

August 11, 2005
LIC-05-0083

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555-0001

Reference: Docket No. 50-285

SUBJECT: Fort Calhoun Station Unit No. 1 License Amendment Request (LAR), "Tri-sodium Phosphate Volume"

Pursuant to 10 CFR 50.90, the Omaha Public Power District (OPPD) hereby requests the following amendment to the Fort Calhoun Station Unit No. 1 (FCS) Operating License.

OPPD proposes to revise Figure 2-3 in Technical Specification (TS) 2.3(4) and related technical information to this figure in the Basis of TS 3.6. This figure shows the minimum volume of Tri-sodium Phosphate (TSP) required for a specified reactor coolant system (RCS) hot zero power (HZP) critical boron concentration (CBC) over the operating cycle. Maintaining a volume of TSP in the baskets that is within the area of acceptable operation of Figure 2-3 ensures that the recirculation water in the containment sump attains a pH of 7.0 or greater following a loss-of-coolant accident (LOCA). This figure allows the required volume of TSP to gradually decrease as HZP CBC decreases during the operating cycle. As HZP CBC decreases, less TSP is required to attain a pH of 7.0 or greater in the containment sump. Also, TS 3.6(2) is being revised to remove the term Dodecahydrate to be consistent with FCS TS Amendment No. 232 (TAC No. MC3214)

This amendment is necessary to account for an increase in RCS volume as a result of the replacement of both steam generators and pressurizer scheduled for the next refueling outage in 2006. It also reflects the removal of excessive conservatisms in calculating the TSP required due to radiolysis products.

OPPD has evaluated this revision and determined that modifying Figure 2-3 does not reduce the margin for pH control and neutralization of all borated water and acid sources following a LOCA.

Attachment 1 provides the technical bases and the No Significant Hazards Evaluation for this requested change to the TS. Attachment 2 contains a marked up version of the Technical Specifications which shows the requested amendment to TS 2.3(4) and TS 3.6 Basis changes.

Attachment 3 contains a clean version of the TSs which incorporates the proposed TS and Basis changes.

OPPD requests approval of this LAR by September 1, 2006, with a 90-day implementation period.

In accordance with 10 CFR 50.91, a copy of this application, with attachments, is being provided to the designated State of Nebraska official.

No commitments are made to the NRC in this letter. If you have any questions, or require information, please contact Thomas C. Matthews at 402-533-6938.

I declare under penalty of perjury that the foregoing is true and correct. (Executed on August 11, 2005.)

Sincerely,

R. T. Ridenoure
Vice President

RTR/RLJ/seb

Attachments:
1. Fort Calhoun Station's Evaluation
2. Mark-up of Technical Specification Pages
3. Proposed Technical Specification Pages

c: B. S. Mallett, NRC Regional Administrator, Region IV
A. B. Wang, NRC Project Manager
J. D. Hanna, NRC Senior Resident Inspector
Division Administrator -Public Health Assurance, State of Nebraska

Omaha Public Power District's Evaluation
for
Amendment of Operating License

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Omaha Public Power District's Evaluation
for
Amendment of Operating License

1.0 Description

The Omaha Public Power District (OPPD) is requesting to amend Operating License DPR-40 for Fort Calhoun Station Unit No. 1 (FCS) by revising Figure 2-3 in Technical Specifications (TS) 2.3(4) and related technical information in TS 3.6 Basis. This figure provides the minimum TSP requirement to attain a containment sump pH greater than or equal to 7.0 and less than or equal to 8.0 in a post loss-of-coolant accident (LOCA) environment.

Currently, Figure 2-3 shows a minimum Tri-sodium Phosphate (TSP) requirement that trends downward with decreasing reactor coolant system (RCS) hot zero power (HZP) critical boron concentration (CBC) over the operating cycle. This figure has a TSP requirement of 128.3 ft^3 at an RCS HZP CBC of 1800 ppm and a TSP requirement of 116.9 ft^3 at an RCS HZP CBC of 550 ppm continuing out to 200 ppm. The methodology for allowing the TSP requirement to vary with RCS HZP CBC was established with FCS through Amendment 232 (Reference 7.7).

The proposed revision to Figure 2-3 shows the same downward trend in TSP requirement but with revised endpoints. The figure is being revised to account for the change in RCS volume due to the replacement of major components and due to removing excessive conservatisms in accounting for radiolysis products. At an RCS HZP CBC of 1800 ppm, 126.8 ft^3 of TSP is required. RCS HZP CBC in the range of 550 ppm to 200 ppm requires 115.0 ft^3 of TSP. The TSP requirements outlined in this figure bound expected HZP CBC for any operating cycle. This proposed revision to Figure 2-3 utilizes the same methodology established in Amendment 232 (Reference 7.7). Also, TS 3.6(2) is being revised to remove the term Dodecahydrate to be consistent with FCS TS Amendment No. 232 (TAC No. MC3214).

The following sections will discuss detailed information regarding the description, technical basis, regulatory requirements, No Significant Hazards, and Environmental Considerations of this license amendment.

2.0 Proposed Change

The proposed amendment to TS 2.3(4) revises the graph shown in Figure 2-3 to show a new minimum required volume of TSP versus HZP CBC over the operating cycle. This revised figure has a minimum required TSP volume of 126.8 ft^3 at the beginning of cycle (BOC) and a minimum required TSP volume of 115.0 ft^3 at the end of cycle (EOC). Based on historical data, the BOC HZP CBC is bounded by 1800 ppm, and EOC is bounded by 550 ppm. The EOC HZP CBC could be less than 550 ppm, so the curve is extended as a horizontal line at this point.

The proposed amendment revises Figure 2-3 of TS 2.3(4) and updates the values in the Basis of TS 3.6. The proposed changes are described below. A mark-up and clean copy of the TS pages are included in Attachments 2 and 3, respectively.

Figure 2-3 of TS 2.3 is revised to show the new areas of acceptable and unacceptable operation for the volume of TSP required over the operating cycle versus HZP CBC. The Basis of TS 3.6 is revised to update the TSP volume requirements, the sump volume, the sump boron concentration, and the engineering analysis reference. TS 3.6(2) is revised to remove the term Dodecahydrate to be consistent with FCS TS Amendment No. 232 (TAC No. MC3214).

3.0 Background

OPPD performs a core reload analysis for every operating cycle. Each core reload analysis determines many cycle operating parameters and limits. One of the limits determined by this analysis is HZP CBC that is updated each cycle in the Technical Data Book (TDB-II), "Reactivity Curves" (Reference 7.1). The HZP CBC is the most limiting CBC and decreases approximately linearly over the operating cycle with core burnup.

The HZP CBC, together with other plant parameters, is then used in the core reload analysis to verify the TS 2.3(4) requirement for the minimum volume of active TSP in the containment sump storage baskets. TSP is required for establishing a pH of 7.0 or greater in the containment sump following a LOCA to counteract the effects of post LOCA generated acids and maintain the sump water at a neutral pH. The minimum required TSP volume is a function of several factors that includes the following:

1. The cycle specific HZP CBC.
2. The cumulative maximum volumes, temperatures, and maximum (or administrative limits if applicable) boron concentrations of borated water sources such as the RCS, the Safety Injection Tanks (SITs), Safety Injection and Refueling Water Tank (SIRWT), and the Boric Acid Storage Tanks (BASTs).
3. Hydrochloric and nitric acids generated from the degradation of electrical cable jackets and radiolysis of air and water following a LOCA.

System Description

Following a LOCA, the components of the core cooling and containment spray systems will be exposed to high temperature, borated water and acids generated as a result of degradation of cable jacket material and radiolysis of air and water. Prolonged exposure to the core cooling water, combined with stresses imposed on the components, can cause Stress Corrosion Cracking (SCC). SCC is a function of stress, oxygen and chloride concentrations, pH, temperature, and alloy composition of the components. High temperatures and a low pH, which would be present

following a LOCA, tend to promote SCC, which can lead to the failure of necessary safety systems or components.

TSP is stored in stainless steel, wire mesh, dissolving baskets located in the containment, on the basement level, near the outer wall. The baskets have a maximum capacity of 131.9 ft^3, which is based on the EEQ consideration of maintaining a pH value of 8.0 or less. The safety injection water dissolves the TSP as it fills containment. Mixing is achieved as the solution is continuously re-circulated. Control of the water pH is critical for the compatibility of the recirculation water with equipment located in the containment.

Following a LOCA, TSP neutralizes the recirculation water in containment by adjusting the pH of the water to a value of 7.0 or greater. This prevents significant amounts of iodine, released from failed fuel and dissolved in the recirculation water, from converting to a volatile form and evolving into the containment atmosphere. High levels of airborne iodine in the containment could increase the radiological consequences of the accident. A pH of 7.0 or greater is also necessary to prevent SCC of austenitic stainless steel components located in the containment, which could increase the probability of component failure.

Radiation levels in the containment may cause the generation of hydrochloric and nitric acids from degradation of cable insulation and radiolysis of air and water following a LOCA. TSP mixed in the recirculation water neutralizes these acids.

USAR References

USAR Section 4.4.3, "Prevention of Stress Corrosion Cracking" (Reference 7.2) specifies the minimum TSP requirement with the same curve as TS Figure 2-3. USAR Section 4.6, "Specific References," lists the calculations and engineering analyses that support plant operation with the present volume of TSP.

Existing Operating Condition

FCS is currently licensed (Reference 7.7) to operate with a minimum TSP volume as shown in Figure 2-3 of TS 2.3(4) and to perform a surveillance test on a refueling frequency to verify that the baskets contain this volume. In addition, TS 3.6(2)d requires a chemistry test to ensure the solubility and buffering ability of the TSP after exposure to the containment environment. The baskets are then filled to their maximum capacity with 131.9 ft^3 of TSP. Surveillance test results show that the volume of TSP in the baskets typically decreases by approximately 5% (due to densification) over the core operating cycle from the "as-left" volume. The current practice is to top off the baskets to ensure that the current minimum TSP volume requirement of 128.3 ft^3 will be met when the "as-found" volume is measured.

Proposed Operating Conditions

To ensure the TSP volume is within the area of acceptable operation as shown in Figure 2-3 of TS 2.3(4), the baskets will be filled as needed. This ensures that a sufficient quantity of TSP is available at any point in the operating cycle for neutralizing boric, hydrochloric, and nitric acids in the recirculation water of the containment sump without adversely impacting EEQ considerations following a LOCA. No change is proposed to existing surveillance testing frequency or testing methods.

4.0 Technical Analysis

4.1 Design Basis

The proposed change to TS 2.3(4) and 3.6 Basis will replace the current TSP requirement with a new curve. The new curve still shows a decreasing TSP requirement with decreasing RCS HZP CBC but with revised endpoints. Compliance with Figure 2-3 will ensure that a containment sump pH range of 7.0 to 8.0 will meet EEQ, iodine, and hydrogen generation design basis objectives.

During the 2006 refueling outage, OPPD will replace both steam generators and the pressurizer. These new components will increase the maximum possible post LOCA sump volume from 397,183 gallons to 398,444 gallons. This change requires a new TSP requirement curve to be generated. Additionally, several conservatisms previously utilized to calculate the amount of TSP needed to neutralize hydrochloric and nitric acids generated as a result of degradation of electric cable jacket material and radiolysis of sump water and air were re-evaluated. The new analysis, which remains consistent with the guidance provided in NUREG-CR 5950, removes some of the inappropriate conservative assumptions previously utilized. Specifically, the following assumptions were removed: a) a post accident dose integration period greater than 30 days, b) inclusion of the IEEE 323 10% safety margin on the dose estimate (applicable only to equipment qualification), and c) inclusion of the total integrated dose contribution due to normal operation over plant life in addition to the 30-day accident dose contribution.

OPPD's evaluation encompassed the following three-step approach:

1. The boron concentration in the containment sump following a LOCA was determined considering the TS and administrative limits for all borated water and acid sources. The design basis formula for calculating this value is established and controlled in the Reference 7. 3.

2. The nature of the TSP-boric acid relationship was established based on the original referenced calculation for the TSP volume needed to raise the pH to a value of 7.0 or greater in the containment sump post LOCA (Reference 7.6). Included in this TSP-boric acid relationship is the additional amount of TSP required to neutralize hydrochloric and nitric acids.

3. The results discussed above were incorporated into a trend which relates the boron concentration maximum administrative limits (in ppm) for containment sump water sources to the TSP volume needed to attain a pH of 7.0 or greater in the containment sump following a LOCA.

The following values are used as inputs to the engineering analysis in Reference 7.5:

SIRWT	2350 ppm
SITs	2350 ppm
BASTs	7867 ppm (4.5 wt% boric acid)
RCS	550 to 1800 ppm

OPPD's engineering analysis (Reference 7.5) determined that compliance with Figure 2-3 will continue to provide a neutral or slightly basic pH in the containment sump following a LOCA. While the end of cycle HZP CBC could be somewhat less than 550 ppm, the allowable volume of TSP is not reduced below that required at 550 ppm, as indicated by the horizontal line on Figure 2-3.

The methodology for allowing the TSP requirement to vary with RCS HZP CBC was previously established with FCS through Amendment 232 (Reference 7.7). This proposed amendment utilizes the same methodology.

The term Dodecahydrate is being removed from TS 3.6(2) as an administrative change to be consistent with Reference 7.7. This TS change should have been included in the License Amendment Request documented in Reference 7.7 but, it was inadvertently missed.

4.2 Risk Information

The scope, level of detail, and technical methods of the calculation (Reference 7.4) and the engineering analysis (Reference 7.5) conducted to justify the proposed TS change, are based on the as-built and as-operated and maintained plant, reflecting the operating experience at FCS. Assumptions, inputs, and conclusions in the calculation and the associated engineering analysis were reviewed and independently verified. A risk-informed approach with the use of probabilistic risk assessment (PRA) or sensitivity study was not considered.

The original calculation (Reference 7.6), which is the basis for FCS Amendment 232 (Reference 7.7), that stated the required TSP volume needed to raise containment sump pH to 7.0 or greater following a LOCA for specified containment sump boron concentrations, included a quality assured independent verification of results.

5.0 Regulatory Analysis

The technical analysis and risk information provided in Section 4.0 satisfy all applicable regulatory requirements and guidance concerning the type and volume of active TSP required in the containment sump to ensure post LOCA recirculation water pH range of 7.0 to 8.0.

OPPD verifies the TSP volume requirements every operating cycle based on the HZP CBC cycle limits as part of its core reload analysis process per Reference 7.3. Any change to the volume of TSP versus HZP CBC curve as shown in Figure 2-3 would require a license amendment.

The proposed changes are limited in scope to the volume of active TSP required when FCS is in Operating Modes 1 and 2 during the operating cycle. As such, FCS must continue to perform all other currently approved TSP verification requirements. These requirements are performed on a refueling frequency and include the following:

1. Visually determining that the volume of active TSP required by Figure 2-3 is contained in the baskets.

2. Performing a chemistry analysis to ensure that adequate solubility and buffering ability of the TSP after exposure to the containment environment exists.

Based on the considerations discussed above, OPPD concluded the following: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security of the health and safety of the public.

5.1 No Significant Hazards Consideration

OPPD has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of Amendment," as discussed below.

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

   Response: No

   There are no changes to the design or operation of the plant that could affect system, component, or accident functions as a result of revising the current volume of active TSP required during Operating Modes 1 and 2 with a new figure that reflects the future RCS volume change. All systems and components function as designed, and the performance requirements have been evaluated and found to be acceptable.

Allowing the required volume of active TSP to decrease over the operating cycle as HZP CBC decreases will ensure a pH of 7.0 or greater in the containment sump following a LOCA, yet provides adequate margin for EEQ concerns as containment sump pH is less likely to exceed 8.0. Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

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

   Response: No

   No new accident scenarios, failure mechanisms, or single failures are introduced as a result of the proposed change. All systems, structures, and components previously required for mitigation of an event remain capable of fulfilling their intended design function with this change to the TS.

   The proposed change has no adverse effects on any safety-related systems or component and does not challenge the performance or integrity of any safety-related system. The proposed change has evaluated the TSP configuration such that no new accident scenarios or single failures are introduced. Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

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

   Response: No

   Allowing the required volume of active TSP to decrease as HZP CBC decreases still ensures a pH of 7.0 or greater in the containment sump following a LOCA and still provides adequate margin for EEQ concerns as containment sump pH is less likely to exceed 8.0. Therefore, this change does not involve a significant reduction in the margin of safety.

   Evaluations were made that indicate that the margin for pH control is not altered by the proposed changes. A TSP volume that is dependent on HZP CBC has been evaluated with respect to neutralization of all borated water and acid sources. These evaluations concluded that there would be no impact on pH control, and hence, no reduction in the margin of safety related to post LOCA conditions.

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

Conclusion

Operation of FCS in accordance with the proposed amendment will not result in a significant increase in the probability or consequences of any accident previously analyzed; will not result in

a new or different kind of accident previously analyzed; and will not result in a significant reduction in a margin of safety.

Based on the considerations discussed above, OPPD concludes that the proposed amendment for revising Figure 2-3 in TS 2.3(4) presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c). Accordingly, a finding of "no significant hazards consideration" is justified.

5.2 Applicable Regulatory Requirements/Criteria

The changes to TS 2.3(4) and to TS 3.6 Basis are consistent with the applicable regulatory requirement in NUREG 0800, Section 6.5.2, "Containment Spray as a Fission Product Cleanup System." Subsection II.1.g specifies that the pH of all solutions in the containment sump and all additives for reactivity control, fission product removal, or other purposes should be maintained at a level high enough to ensure that significant long-term iodine re-evolution does not occur. Long-term iodine retention may be assumed only when the equilibrium sump solution pH, after mixing and diluting with primary coolant and emergency core cooling system (ECCS) injection sources, is above 7.0.

OPPD engineering analysis (Reference 7.5) conservatively assumes that all borated water sources are at their maximum volume and maximum, or administrative limit if applicable, boron concentration in calculating the volume of TSP required to achieve a recirculation water pH of 7.0 or greater.

No other regulatory requirements or regulatory guidance were identified to be applicable to these TS changes.

6.0 Environmental Consideration

A review has determined that the proposed amendment would not change the requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would not change an inspection or surveillance requirement. The design function of the TSP storage baskets located in containment will not change nor does OPPD intend to change its current practice for filling the baskets with active TSP.

The proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental assessment needs to be prepared in connection with the proposed amendment.

7.0 References

7.1 FCS Technical Data Book, TDB-II, "Reactivity Curves"

7.2 FCS Updated Safety Analysis Report (USAR), Section 4.4.3, "Prevention of Stress Corrosion Cracking"

7.3 Production Engineering Division, Nuclear Engineering Instruction, PED-NEI-4, "Interface Requirements for Reload Analysis Process"

7.4 Fort Calhoun Calculation, FC07153, Revision 0, 6/17/2005, "Tri-Sodium Phosphate (TSP) Volume Needed to Neutralize Containment Sump Acids Post LOCA"

7.5 Fort Calhoun Engineering Analysis, EA05-015, Revision 0, "Revised Minimum Trisodium Phosphate (TSP) Volume Required in Containment Sump as a Function of RCS Critical Boron Concentration (ARO, HZP, No Xenon)"

7.6 ABB Calculation O-PENG-CALC-002, Revision 1, 12/04/95, "Calculation of Tri-Sodium Phosphate Dodecahydrate Concentrations as a Function of Boric Acid Concentrations and pH Values"

7.7 Letter from NRC (A. B. Wang) to OPPD (R. T. Ridenoure), FCS Issuance of Amendment RE: (TAC NO. MC3214), March 1, 2005 (NRC-05-0025)

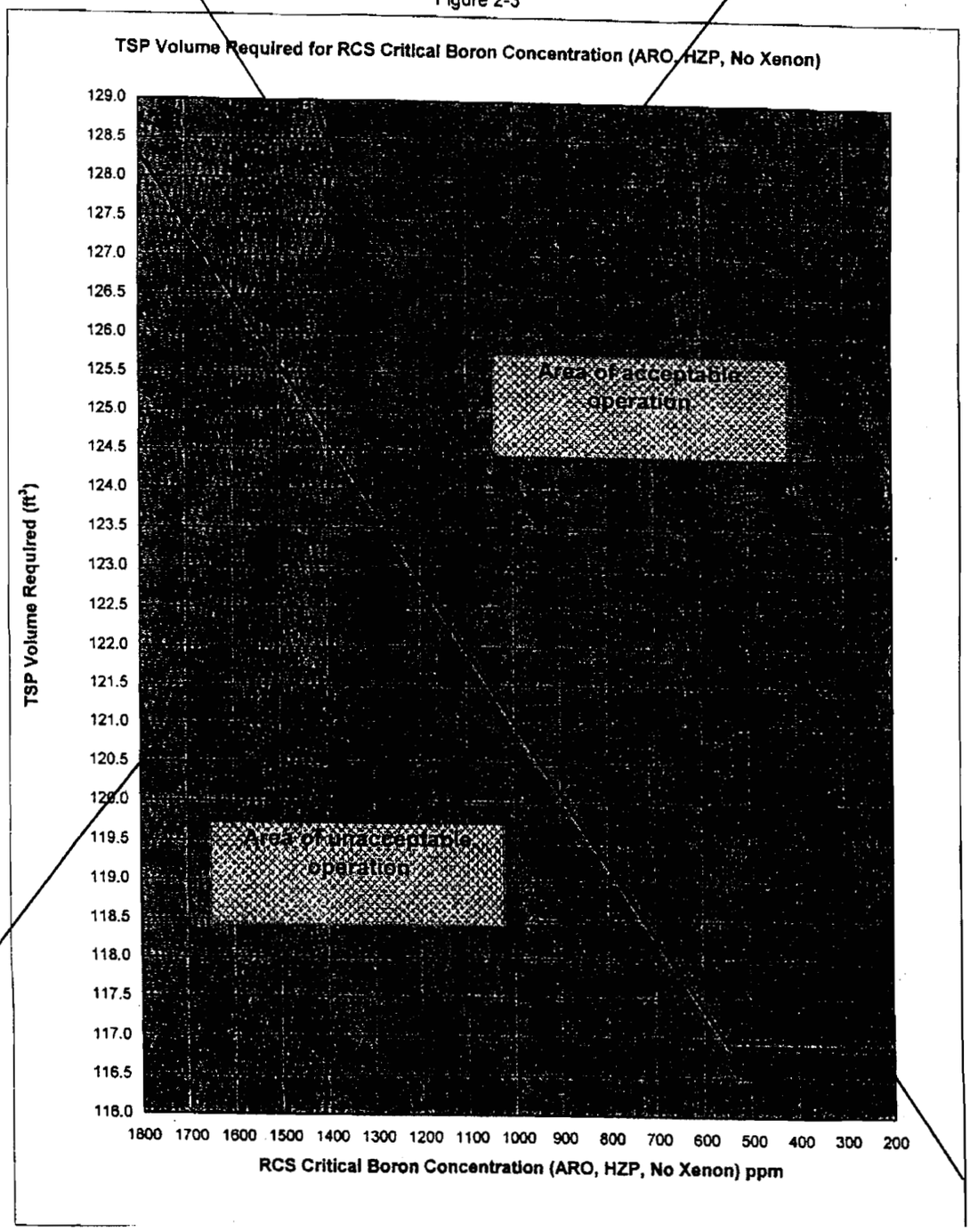
Mark-up of Technical Specification Pages

TECHNICAL SPECIFICATIONS

Replace with new Figure 2-3

2.0 **LIMITING CONDITIONS FOR OPERATION**
2.3 Emergency Core Cooling System (Continued)

Figure 2-3

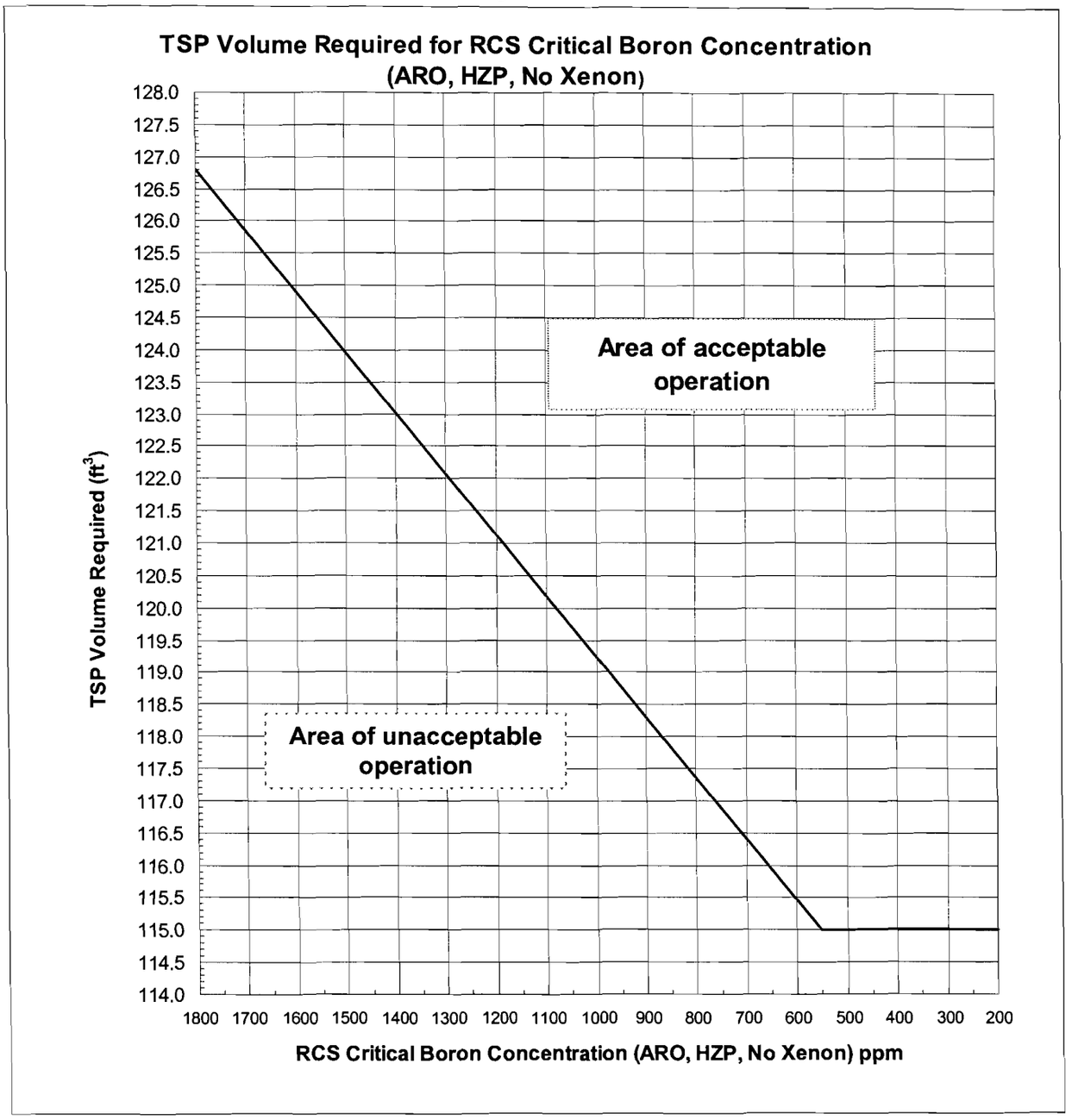


TECHNICAL SPECIFICATIONS

2.0 **LIMITING CONDITIONS FOR OPERATION**
2.3 Emergency Core Cooling System (Continued)

New Figure

Figure 2-3



3.0 **SURVEILLANCE REQUIREMENTS**

3.6 Safety Injection and Containment Cooling Systems Tests (Continued)

Operation of the system for 10 hours every month will demonstrate operability of the filters and adsorbers system and remove excessive moisture build-up on the adsorbers.

Demonstration of the automatic initiation capability will assure system availability.

Periodic determination of the volume of TSP in containment must be performed due to the possibility of leaking valves and components in the containment building that could cause dissolution of the TSP during normal operation.

A refueling frequency shall be utilized to visually determine that the volume of TSP contained in the TSP baskets is within the area of acceptable operation based on the TSP volume required by Figure 2-3. A measured value or the Technical Data Book (TDB) II, "Reactivity Curves" may be used to obtain a hot zero power (HZP) critical boron concentration (CBC). The "as found" volume of TSP must be within the area of acceptable operation of Figure 2-3 using this HZP CBC value. Prior to exiting the refueling outage, another visual TSP volume determination is performed to ensure that the "as-left" volume of TSP contained in the baskets is ≥126.8 ~~128.3~~ ft^3. This requirement ensures that there is an adequate quantity of TSP to adjust the pH of the post-LOCA sump solution to a value ≥ 7.0 for HZP CBC up to 1800 ppm.

The periodic pH verification is also required on a refueling frequency. Operating experience has shown this surveillance frequency acceptable due to margin in the volume of TSP placed in the containment building.

An "as-left" representative sample of 1.78 - 1.81 grams of TSP from one of the baskets in containment is submerged in 0.99 - 1.01 liters of water at a boron concentration of 2437 ~~2439~~ - 2459 ppm (equivalent to a RCS boron concentration of 1800 pm - Figure 2-3). At a standard temperature of 115 -125°F, without agitation, the solution should be left to stand for 4 hours. The liquid is then decanted and mixed, the temperature adjusted to 75 - 79°F and the pH measured. At this point the pH must be ≥7.0. The representative sample weight is based on the minimum required TSP weight at the beginning of cycle of 6,720 ~~6,800~~ lbs_m which, at a manufactured density of at least 53.0 lb_m/ft^3 corresponds to the minimum volume of 126.8 ~~128.3~~ ft^3, and maximum possible post-LOCA sump volume of 398,444 ~~397,183~~ gallons, normalized to buffer a 1.0 liter sample.

3.0 **SURVEILLANCE REQUIREMENTS**

3.6 Safety Injection and Containment Cooling Systems Tests (Continued)

Testing of the "as found" condition must be performed to ensure the solubility and buffering ability of the TSP after exposure to the containment environment. The "as found" test is performed in the same manner as the "as-left" test. However, a different sample size and boron concentration is used based on the end of cycle HZP CBC. The representative sample size, boron concentration of sample water, minimum required TSP weight, and minimum volume of TSP are all a function of the end of cycle HZP CBC as specified in EA05-015 ~~EA-FC-03-041~~. The "as found" volume of TSP corresponds to the maximum possible boron concentration corresponding to the maximum possible post-LOCA sump volume of 398,444 ~~397,183~~ gallons, normalized to a buffer a 1.0 liter sample.

The boron concentration of the test water is representative of the maximum possible boron concentration corresponding to the maximum possible post-LOCA sump volume. The post-LOCA sump volume originates from the Reactor Coolant System (RCS), the Safety Injection Refueling Water Tank (SIRWT), the Safety Injection Tanks (SITs) and the Boric Acid Storage Tanks (BASTs). The maximum post-LOCA sump boron concentration is based on a cumulative boron concentration in the RCS, SIRWT, SITs and BASTs of 2447 ~~2449~~ ppm at beginning of cycle (HZP CBC = 1800 ppm) and 2327 ~~2333~~ ppm at end of cycle (HZP CBC $\leq$ 550 ppm). These values are based on the SIRWT and SITs at 2350 ppm and the BASTS at 4.5 wt. % boron. Agitation of the test solution is prohibited, since an adequate standard for the agitation intensity cannot be specified. The test time of 4 hours is necessary to allow time for the dissolved TSP to naturally diffuse through the sample solution. In the post-LOCA containment sump, rapid mixing would occur, significantly decreasing the actual amount of time before the required pH is achieved. This would ensure achieving a pH $\geq$7.0 by the onset of recirculation after a LOCA.

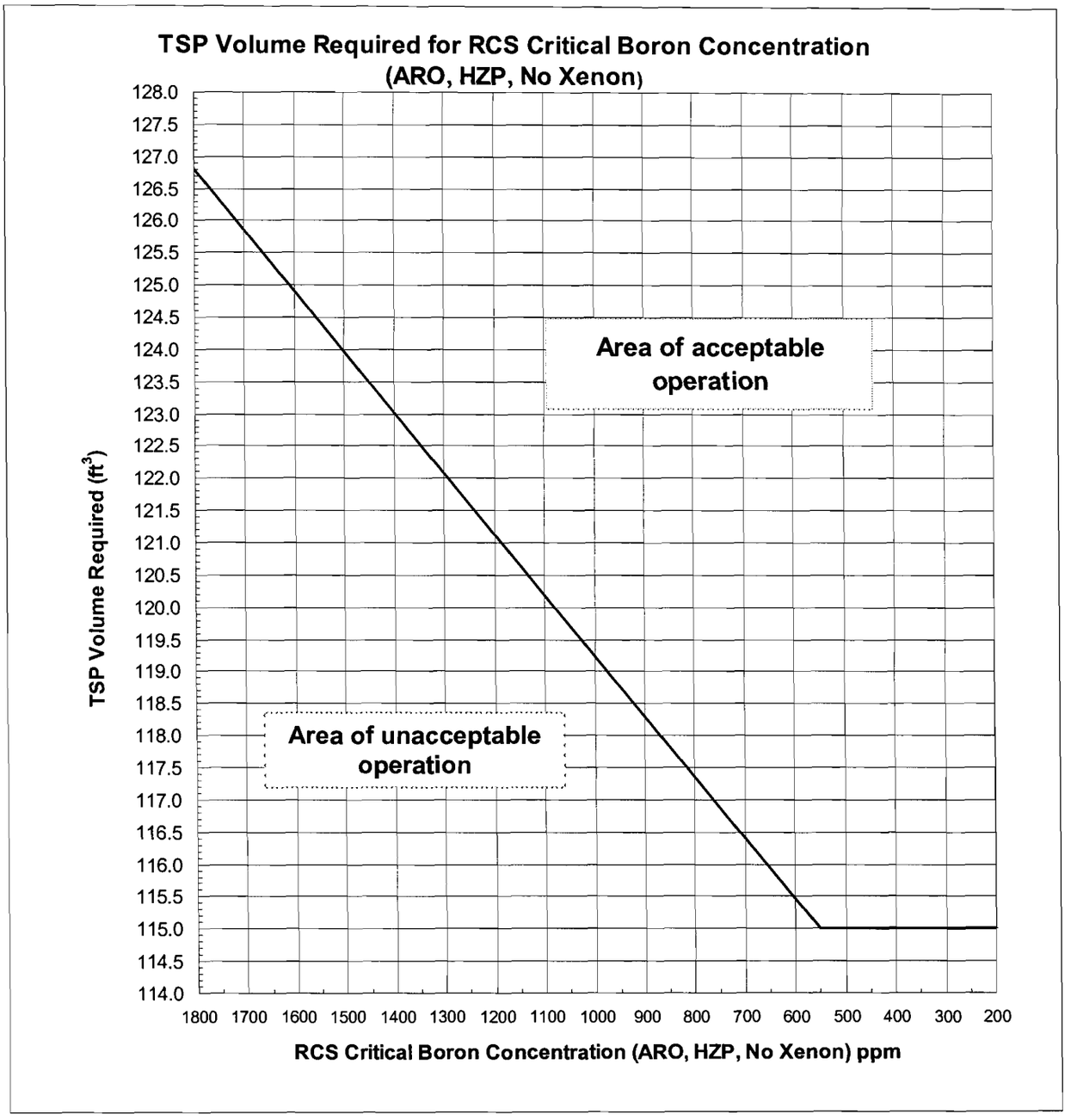
References

(1) USAR, Section 6.2
(2) USAR, Section 6.3
(3) USAR, Section 14.16
(4) USAR, Section 6.4
(5) EA05-015, ~~EA-FC-03-041,~~ 7/6/05, "Revised Minimum Trisodium Phosphate (TSP) Volume Required in Containment Sump as a Function of RCS Critical Boron Concentration (ARO, HZP, No Xenon)"

Proposed Technical Specification Pages

2.0 **LIMITING CONDITIONS FOR OPERATION**
2.3 Emergency Core Cooling System (Continued)

Figure 2-3



3.0 **SURVEILLANCE REQUIREMENTS**

3.6 Safety Injection and Containment Cooling Systems Tests (Continued)

Operation of the system for 10 hours every month will demonstrate operability of the filters and adsorbers system and remove excessive moisture build-up on the adsorbers.

Demonstration of the automatic initiation capability will assure system availability.

Periodic determination of the volume of TSP in containment must be performed due to the possibility of leaking valves and components in the containment building that could cause dissolution of the TSP during normal operation.

A refueling frequency shall be utilized to visually determine that the volume of TSP contained in the TSP baskets is within the area of acceptable operation based on the TSP volume required by Figure 2-3. A measured value or the Technical Data Book (TDB) II, "Reactivity Curves" may be used to obtain a hot zero power (HZP) critical boron concentration (CBC). The "as found" volume of TSP must be within the area of acceptable operation of Figure 2-3 using this HZP CBC value. Prior to exiting the refueling outage, another visual TSP volume determination is performed to ensure that the "as-left" volume of TSP contained in the baskets is $\geq$126.8 ft^3. This requirement ensures that there is an adequate quantity of TSP to adjust the pH of the post-LOCA sump solution to a value $\geq$ 7.0 for HZP CBC up to 1800 ppm.

The periodic pH verification is also required on a refueling frequency. Operating experience has shown this surveillance frequency acceptable due to margin in the volume of TSP placed in the containment building.

An "as-left" representative sample of 1.78 - 1.81 grams of TSP from one of the baskets in containment is submerged in 0.99 - 1.01 liters of water at a boron concentration of 2437 - 2459 ppm (equivalent to a RCS boron concentration of 1800 pm - Figure 2-3). At a standard temperature of 115 -125°F, without agitation, the solution should be left to stand for 4 hours. The liquid is then decanted and mixed, the temperature adjusted to 75 - 79°F and the pH measured. At this point the pH must be $\geq$7.0. The representative sample weight is based on the minimum required TSP weight at the beginning of cycle of 6,720 lbs_m which, at a manufactured density of at least 53.0 lb_m/ft^3 corresponds to the minimum volume of 126.8 ft^3, and maximum possible post-LOCA sump volume of 398,444 gallons, normalized to buffer a 1.0 liter sample.

3.0 **SURVEILLANCE REQUIREMENTS**

3.6 Safety Injection and Containment Cooling Systems Tests (Continued)

Testing of the "as found" condition must be performed to ensure the solubility and buffering ability of the TSP after exposure to the containment environment. The "as found" test is performed in the same manner as the "as-left" test. However, a different sample size and boron concentration is used based on the end of cycle HZP CBC. The representative sample size, boron concentration of sample water, minimum required TSP weight, and minimum volume of TSP are all a function of the end of cycle HZP CBC as specified in EA05-015. The "as found" volume of TSP corresponds to the maximum possible boron concentration corresponding to the maximum possible post-LOCA sump volume of 398,444 gallons, normalized to a buffer a 1.0 liter sample.

The boron concentration of the test water is representative of the maximum possible boron concentration corresponding to the maximum possible post-LOCA sump volume. The post-LOCA sump volume originates from the Reactor Coolant System (RCS), the Safety Injection Refueling Water Tank (SIRWT), the Safety Injection Tanks (SITs) and the Boric Acid Storage Tanks (BASTs). The maximum post-LOCA sump boron concentration is based on a cumulative boron concentration in the RCS, SIRWT, SITs and BASTs of 2447 ppm at beginning of cycle (HZP CBC = 1800 ppm) and 2327 ppm at end of cycle (HZP CBC $\leq$ 550 ppm). These values are based on the SIRWT and SITs at 2350 ppm and the BASTS at 4.5 wt. % boron. Agitation of the test solution is prohibited, since an adequate standard for the agitation intensity cannot be specified. The test time of 4 hours is necessary to allow time for the dissolved TSP to naturally diffuse through the sample solution. In the post-LOCA containment sump, rapid mixing would occur, significantly decreasing the actual amount of time before the required pH is achieved. This would ensure achieving a pH $\geq$7.0 by the onset of recirculation after a LOCA.

References

(1) USAR, Section 6.2
(2) USAR, Section 6.3
(3) USAR, Section 14.16
(4) USAR, Section 6.4
(5) EA05-015, 7/6/05, "Revised Minimum Trisodium Phosphate (TSP) Volume Required in Containment Sump as a Function of RCS Critical Boron Concentration (ARO, HZP, No Xenon)"