Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381-2000

MAY 3 0 2003

TVA-WBN-TS-03-02

10 CFR 50.90

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

Gentlemen:

In the Matter of ) Docket No. 50-390
Tennessee Valley Authority )

**WATTS BAR NUCLEAR PLANT (WBN) UNIT 1 - TECHNICAL SPECIFICATION CHANGE 03-02, "REVISION OF BORON REQUIREMENTS FOR COLD LEG ACCUMULATORS AND REFUELING WATER STORAGE TANK"**

Pursuant to 10 CFR 50.90, TVA is submitting a request for a TS change (TVA-WBN-TS-03-02) to Operating License NPF-90 for WBN Unit 1. The proposed TS change revises Technical Specification Surveillance Requirement 3.5.1.4, "Accumulators" and 3.5.4.3, "RWST" to modify the single boron concentration requirement by inserting a table that defines the minimum and maximum amount of boron that is required for accident mitigation based on the number of tritium producing burnable absorber rods (TPBARs) in the core. Three different ranges of TPBARs are utilized in the tables with the corresponding boron values listed. A note is included in the proposed change stating that the current number of tritium producing rods in the core can be found in the Core Operating Limits Report. This change is similar to one previously submitted on March 13, 2003, by TVA for the Sequoyah Nuclear Plant.

TVA has determined that there are no significant hazards considerations associated with the proposed change and the TS change qualifies for a categorical exclusion from environmental review pursuant to the provisions of 10 CFR 51.22(c)(9).

D030

MAY 3 0 2003

Additionally, in accordance with 10 CFR 50.91(b)(1), TVA is sending a copy of this letter and attachments to the Tennessee State Department of Public Health.

Enclosure 1 to this letter provides the description and evaluation of the proposed change. This includes TVA's determination that the proposed change does not involve a significant hazards consideration, and is exempt from environmental review. Enclosure 2 contains copies of the appropriate TS pages marked-up to show the proposed change. Enclosure 3 contains copies of the appropriate TS Bases pages marked-up to show the proposed change.

This request has been applied to the pages previously approved by NRC on September 23, 2002, in Amendment 40. This amendment was not scheduled for implementation until TPBARs were loaded into the WBN reactor. The U.S. Department of Energy (DOE) has requested that TVA insert TPBARs into the core during the outage currently scheduled for the Fall of 2003. Therefore, TVA is asking that this TS change be approved by September 15, 2003, and that the implementation of the revised TS be consistent with the implementation of the previously approved tritium amendment.

There are no regulatory commitments associated with this submittal. This letter is being sent in accordance with NRC Regulatory Issue Summary 2001-05.

MAY 30 2003

If you have any questions about this change, please contact me at (423) 365-1824.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 30th day of May, 2003.

Sincerely,

P. L. Pace
Manager, Site Licensing
and Industry Affairs

Enclosures
1. TVA Evaluation and Proposed Change
2. Proposed Technical Specification Changes (mark-up)
3. Changes to Technical Specification Bases Pages

cc: See page 4

MAY 3 0 2003

cc (Enclosures):
NRC Resident Inspector
Watts Bar Nuclear Plant
1260 Nuclear Plant Road
Spring City, Tennessee 37381

Mr. K. N. Jabbour, Senior Project Manager
U.S. Nuclear Regulatory Commission
MS 08G9
One White Flint North
11555 Rockville Pike
Rockville, Maryland 20852-2738

U.S. Nuclear Regulatory Commission
Region II
Sam Nunn Atlanta Federal Center
61 Forsyth St., SW, Suite 23T85
Atlanta, Georgia 30303

Mr. Lawrence E. Nanny, Director
Division of Radiological Health
3rd Floor
L&C Annex
401 Church Street
Nashville, TN 37243

**ENCLOSURE 1**

**TENNESSEE VALLEY AUTHORITY**
**WATTS BARS BAR NUCLEAR PLANT (WBN)**
**UNIT 1**

**TVA EVALUATION OF PROPOSED CHANGE**

---

## 1. DESCRIPTION

This letter is a request to amend Operating License NPF-90 for Watts Bar Nuclear Plant (WBN) Unit 1. The proposed Technical Specification (TS) change will revise WBN Unit 1 TS Surveillance Requirements (SRs) 3.5.1.4, "Accumulators," and 3.5.4.3, "Refueling Water Storage Tank (RWST)," to modify the single boron concentration requirement by inserting a table that defines the minimum and maximum amount of boron that is required for accident mitigation based on the number of tritium producing burnable absorber rods (TPBARs) in the core. This proposed change will allow the flexibility to adjust boron levels as necessary based on the number of TPBARs in the core. This will minimize cost and reduce operational burden associated with the addition of large amounts of boron into these systems until the TPBAR loading requires the boron to support accident mitigation functions.

## 2. PROPOSED CHANGE

This amendment request will revise SRs 3.5.1.4, "Accumulators," and 3.5.4.3, "RWST," to modify the single boron concentration requirement by inserting a table that defines the minimum and maximum amount of boron that is required for accident mitigation based on the number of TPBARs in the core. Three different ranges of TPBARs are utilized in the tables with corresponding boron values listed. A note is included in the proposed change that states that the number of TPBARs in the core for a given cycle can be found in the Core Operating Limits Report. This note ensures that the specific number of rods can be identified for determining the amount of boron that is required.

In addition, supporting changes to each corresponding bases pages are being made as indicated by the page mark-ups in Enclosure 2. Specifically, a statement on TS bases page B 3.5-4 regarding no control rod credit is being removed since

the Westinghouse methodology credits control rod insertion during a cold leg loss of coolant accident (LOCA) break. A discussion of TPBARs is included on bases page B 3.5-26.

This proposed change has been applied to the issued pages previously approved by NRC on September 23, 2002, in WBN Amendment 40. This amendment was not scheduled for implementation until TPBARs were loaded into the WBN reactor. Amendment 40 addressed the changes needed for the production of tritium and included boron changes for the cold leg accumulators (CLAs) and RWST. If approved, this amendment will be implemented in conjunction with the other changes previously approved by the tritium production amendment. Please refer to the specific TS pages markups provided in Enclosure 2.

In summary, the boron requirements for CLAs and RWST will be modified to allow smaller boron increases consistent with safety considerations.

**3. BACKGROUND**

The U.S. Department of Energy (DOE) has chosen both TVA's Watts Bar and Sequoyah Nuclear Plants to produce tritium for the replenishment of the National Security Stockpile by irradiating TPBARs installed in the reload cores at each refueling outage. The number of TPBARs required to be irradiated is to be identified by the DOE. Based on these numbers, TVA, along with its fuel vendors, will determine the number of TPBARs to be installed and irradiated at each site.

Generally, TPBARs act as burnable absorber rods normally found in similar reactor core designs. However, unlike standard burnable absorber rods which lose their poison effects over the life of the cycle, some residual effect remains in the TPBARs at the end of the cycle. When larger amounts of excess neutron poisons (as in the case with larger loads of TPBARs) are added to a core, there is competition for neutrons from all the poison and the negative worth of each poison (including the reactor coolant system (RCS) boron) decreases. The positive reactivity insertion due to the negative moderator coefficient that occurs during the cooldown from hot full power to cold conditions following a LOCA must be overcome by RCS boron. Because the RCS boron is now worth less, it takes a higher concentration to maintain subcriticality.

The minimum boron requirement for the CLA ensures that the reactor core will remain subcritical during the post-LOCA recirculation phase based upon the CLA's contribution to the post-LOCA sump mixture concentration. The functions and design of the CLAs is found in Section 6.3 of the WBN Updated Final Safety Analysis Report (UFSAR). The minimum boron requirement for the RWST ensures that sufficient negative reactivity is injected into the core to counteract any positive increase in reactivity caused by reactor coolant system cooldown. The RWST serves several purposes in addition to the injection of borated water during accident conditions. These functions are described in various sections of the UFSAR, including Sections 6.2.2, 6.3, 9.1.3, 15.2.4, and 15.4.3.

The CLAs are required to be operable in Modes 1, 2 and 3 and the RWST in Modes 1, 2, 3, and 4. WBN Surveillance Requirements 3.5.1.4 and 3.5.4.3 associated with these functions also include requirements for borated water volume. The CLA's specification has isolation valve and nitrogen cover-pressure requirements and the RWST specification includes requirements for temperature. These limitations all support the ability of the CLAs and RWST to replace water to keep the core cooled and to ensure that sufficient boron is available to maintain the reactor in a sub-critical condition during postulated accident conditions. The CLAs are passive devices that inject automatically when the reactor coolant system pressure drops below the accumulator's cover-pressure. The RWST provides borated water to the emergency core cooling system pumps for injection into the reactor. Three different sets of pumps are utilized to accommodate different size breaks in the reactor coolant system. The RWST also provides water to the containment spray systems to control containment pressure during high energy line break accidents. When the injection of the RWST volume has been completed, the pumps switchover to the containment sump to continue the core cooling and containment pressure control functions.

**4. TECHNICAL ANALYSIS**

The proposed change provides boron concentration requirements for the CLAs and RWST that correlate to the number of TPBARs in the core. Westinghouse has performed calculations within similar constraints as used for the tritium production amendment but has included an additional potential unborated water inleakage into containment as described in TVA letter dated March 24, 2003 (WBN-TS-03-06)

and has deleted the case for TPBAR failure with no control rod insertion. NRC approved and issued WBN Amendment 40 for Unit 1 using the previous methodology as the basis for the currently approved boron requirements for the CLAs and RWST. The previous methodology was reported in Westinghouse Topical Report NDP-00-0344, Revision 1, "Implementation and Utilization of Tritium Producing Burnable Absorber Rods (TPBARS) in Watts Bar Unit 1," dated July 2001, and included as Enclosure 4 in TVA's TS Change Request 00-015, "Watts Bar Nuclear Plant (WBN) - Unit 1 - Revision of Boron Concentration Limits and Reactor Core Limitations for Tritium Production Cores (TPCs) - Technical Specification (TS) Change No. TVA-WBN-00-015," dated August 20, 2001. The methodology used for the current effort is similar to that described in Section 2.15.5.4 of the above topical report with the exception of the additional unborated source which is described in the TVA letter dated March 24, 2003 and has deleted the case for TPBAR failure with no control rod insertion. Since this methodology credits control rod insertion for a cold leg break, a statement on TS bases page B 3.5-4, regarding no control rod insertion credit, is being removed.

Table 1, below, provides Cases 1-3 for various numbers of TPBARs which will correspond to the CLA and RWST boron concentrations using the above methodology.

**Table 1**
**CLA and RWST Boron Concentrations - Cases 1-3**

| Case No. | Number of TPBARs | Minimum CLA Boron ppm | Maximum CLA Boron ppm | Minimum RWST Boron ppm | Maximum RWST Boron ppm | Sump Boron Concentration ppm | Critical Boron Concentration ppm |
|---|---|---|---|---|---|---|---|
| 1 | 0-240 | 2600 | 2900 | 2700 | 2900 | 1932 | 1909 |
| 2 | 241-1000 | 3000 | 3300 | 3100 | 3300 | 2087 | 2055 |
| 3 | 1001-2304 | 3500 | 3800 | 3600 | 3800 | 2270 | 2114 |

For Case 1 and 2, additional Westinghouse calculations were performed to consider the interim loading values of approximately 240 and 1000 TPBARs. These interim ranges were calculated in the same manner by taking into account the maximum number of TPBARs in the range and determining the amount of boron that will satisfy the safety function of the CLAs and RWST.

For Case 3, the proposed boron requirements for 1001 to 2304 TPBARs is the same as was approved for tritium production and was based on a maximum loading of 2304 TPBARs.

The proposed boron concentration values ensure that the post LOCA accident sump boron concentration is sufficient to prevent core re-criticality with the associated number of TPBARs in the core. The analysis for required boron considers the reactivity holddown effect associated with the additional reactivity poison caused by the TPBARs in the core and the boron needed to offset the effects of possible leaching of lithium following a LOCA.

In summary, this change allows operational flexibility with respect to the amount of boron that must be achieved and maintained to satisfy the safety function of the CLAs and RWST. Implementation of the proposed TS change will maintain the necessary boron concentration to mitigate the consequences of an accident and will continue to minimize the risk to the health and safety of the public.

## 5. REGULATORY SAFETY ANALYSIS

### 5.1 No Significant Hazards Consideration

The proposed TS change will revise Watts Bar Nuclear Plant (WBN) Unit 1 Technical Specification (TS) Surveillance Requirements (SRs) 3.5.1.4, "Accumulators," and 3.5.4.3, "Refueling Water Storage Tank (RWST)," to modify the single boron concentration requirement by inserting a table that defines the amount of boron that is required for accident mitigation based on the number of tritium producing burnable absorber rods (TPBARs) in the core. This proposed change will allow the flexibility to adjust boron levels as necessary based on the number of TPBARs in the core. A note is included in the proposed change stating that the current number of tritium producing rods in the core can be found in the Core Operating Limits Report. This note ensures that the specific number of rods can be identified for determining the amount of boron that is required. In addition, supporting changes to each corresponding bases pages are being made.

TVA 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 amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No.

   The proposed change modifies the required boron concentration for the cold leg accumulators (CLAs) and RWST. The proposed values have been verified to maintain the required accident mitigation safety function for the CLAs and RWST. The CLAs and RWST safety function is to mitigate accidents that require the injection of borated water to cool the core and to control reactivity. These functions are not potential sources for accident generation and the modification of the boron concentration that supports event mitigation will not increase the potential for an accident. Therefore, the possibility of an accident is not increased by the proposed changes. The boron levels for this change are based on the number of TPBARs in the core. As the number of rods is increased the need for additional shutdown boron also increases. This effect has been evaluated with a similar methodology utilized for previously NRC approved amendments associated with tritium production. This methodology ensures that the impact of TPBARs is adequately compensated for by the required boron concentrations and has been incorporated into the proposed revision. Since the boron levels will continue to maintain the safety function of the CLAs and RWST in the same manner as currently approved, the consequences of an accident are not increased by the proposed changes.

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

   Response: No

   The proposed change only modifies boron concentrations for accident mitigation functions of the CLAs and RWST. These functions do not have a potential to generate accidents as they only serve to perform mitigation functions associated with an

accident. The proposed requirements will maintain the mitigation function in an identical manner as currently approved. There are no plant equipment or operational changes associated with the proposed revision other than the adjustment of the boron level in the CLAs and RWST. Therefore, since the CLA and RWST functions are not altered and the plant will continue to operate without change, the possibility of a new or different kind of an accident is not created.

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

   Response: No.

   This change proposes boron concentration requirements that support the accident mitigation functions of the CLAs and RWST equivalent to the currently approved limits. The proposed change does not alter any plant equipment or components and does not alter any setpoints utilized for the actuation of accident mitigation system or control functions. The proposed boron values have been verified to provide an sdequate level of reactivity control for accident mitigation. Therefore, the proposed change will not involve a significant reduction in a margin of safety.

Based on the above, TVA concludes that the proposed amendment involves, no significant hazards consideration under the standards set forth in 10 CFR 50.92 (c), and accordingly, a finding of "no significant hazards consideration" is justified.

5.2 Applicable Regulatory Requirements/Criteria

The proposed amendment requests changes to the CLA and RWST boron concentration requirements by adding interim concentration steps depending upon the number of TPBARS installed in the core at a given cycle. The CLA and RWST functions are described in UFSAR Sections 6.2.2, 6.3, 9.1, 15.2.4 and 15.4.3, respectively. For these sections, the principal review performed by NRC is documented in the Safety Evaluation Report (SER), NUREG-0847, dated June 1982. The assessment of these functions is documented in the following sections of the SER:

6.2.2, "Containment Heat Removal Systems"

6.3, "Emergency Core Cooling System"

9.1, "Fuel Storage Facility"

15.2.4, "Reactivity and Power Distribution Anomalies"

15.4, "Radiological Consequences of Accidents"

Subsequent to the above review, by application dated August 20, 2001, TVA requested a license amendment to revise the WBN TS to address the irradiation of TPBARs for the DOE. Part of that amendment requested that both the CLA and RWST boron concentrations be raised to accommodate the irradiation of a maximum of 2304 TPBARs during a single cycle. NRC approved and issued a Safety Evaluation (SE) for that amendment on September 23, 2002. NRC's review of those boron concentration changes is documented in SE Section 3.2, "Evaluation of Technical Specification Changes."

The change proposed by this amendment has been calculated by Westinghouse using a similar methodology as was used during the initial plant licensing and subsequent tritium amendment's proposed changes to determine CLA and RWST boron concentrations. The added note to each TS surveillance requirement is intended to indicate that the Core Operating Limits Report is the location where plant operators can determine the number of TPBARs that are in the reactor for a given cycle. This allows the operators to verify, upon startup prior to entry into a mode where the RWST and the CLA are required to be operable, that the acceptance criteria for each surveillance requirement for boron concentrations are met. The proposed change continues to ensure sufficient boron concentrations to prevent a recriticality event during postulated accidents and will not adversely affect compliance with the requirements for emergency core cooling systems in 10 CFR 50.46 or Appendix K of 10 CFR 50.

In conclusion, based on the considerations discussed above, (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 or to the health and safety of the public.

## 6. ENVIRONMENTAL CONSIDERATION

The proposed change 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 criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

## 7. REFERENCES


1. Watts Bar Nuclear Plant, Updated Final Safety Analysis Report, Amendment 3, Sections 6.2.2, 6.3, 9.1, 15.2.4 and 15.4.3, dated August 30, 2002.
2. Westinghouse Topical Report NDP-00-0344, Revision 1, "Implementation and Utilization of Tritium Producing Burnable Absorber Rods (TPBARS) in Watts Bar Unit 1," dated July 2001.
3. TVA's letter to NRC dated August 20, 2001, "Watts Bar Nuclear Plant (WBN) - Unit 1 - Revision of Boron Concentration Limits, Reactor Core Limitations for Tritium Production Cores (TPCs) - Technical Specification (TS) Change No. TVA-WBN-TS-00-015."
4. NRC's letter to TVA dated September 23, 2002, "Watts Bar Nuclear Plant, Unit 1 - Issuance of Amendment to Irradiate up to 2304 Tritium-Producing Burnable Absorber Rods in the Reactor Core (TAC No. MB1884)."

ENCLOSURE 2

TVA-WBN-TS-03-02

REFUELING WATER STORAGE TANK AND COLD LEG
ACCUMULATOR BORON CONCENTRATION CHANGES

PROPOSED TECHNICAL SPECIFICATION PAGE MARKUPS

AFFECTED PAGES

TS PAGES

TS 3.5-2
TS 3.5-10

SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.5.1.1 | Verify each accumulator isolation valve is fully open. | 12 hours |
| SR 3.5.1.2 | Verify borated water volume in each accumulator is ≥ 7630 gallons and ≤ 8000 gallons. | 12 hours |
| SR 3.5.1.3 | Verify nitrogen cover pressure in each accumulator is ≥ 610 psig and ≤ 660 psig. | 12 hours |
| SR 3.5.1.4 | Verify boron concentration in each accumulator is ≥ 3500 ppm and ≤ 3800 ppm. | 31 days<br>AND<br>-----NOTE------<br>Only required to be performed for affected accumulators<br>---------- Once within 6 hours after each solution volume increase of ≥ 75 gallons, that is not the result of addition from the refueling water storage tank |

(continued)

**REVISE AS FOLLOWS:**

Verify boron concentration in each accumulator is as provided below depending on the number of tritium producing burnable absorber rods (TPBARs) installed in the reactor core for this operating cycle:

| Number of TPBARs | Boron Concentration Ranges |
|---|---|
| 0-240 | ≥ 2600 ppm and ≤ 2900 ppm |
| 241-1000 | ≥ 3000 ppm and ≤ 3300 ppm |
| 1001-2304 | ≥ 3500 ppm and ≤ 3800 ppm |

**ADD NOTE:**

The number of TPBARs in the reactor core is contained in the Core Operating Limits Report (COLR) for each operating cycle.

SURVEILLANCE REQUIREMENTS

| | SURVEILLANCE | FREQUENCY |
|---|---|---|
| SR 3.5.4.1 | ----------NOTE----------<br>Only required to be performed when ambient air temperature is < 60°F or > 105°F.<br>----------<br>Verify RWST borated water temperature is ≥ 60°F and ≤ 105°F. | 24 hours |
| SR 3.5.4.2 | Verify RWST borated water volume is ≥ 370,000 gallons. | 7 days |
| SR 3.5.4.3 | Verify RWST boron concentration is ≥ 3600 ppm and ≤ 3800 ppm. | 7 days |

**REVISE AS FOLLOWS:**

Verify boron concentration in the RWST is as provided below depending on the number of tritium producing burnable absorber rods (TPBARs) installed in the reactor core for this operating cycle:

| Number of TPBARs | Boron Concentration Ranges |
|---|---|
| 0-240 | ≥ 2700 ppm and ≤ 2900 ppm |
| 241-1000 | ≥ 3100 ppm and ≤ 3300 ppm |
| 1001-2304 | ≥ 3600 ppm and ≤ 3800 ppm |

**ADD NOTE:**

The number of TPBARs in the reactor core is contained in the Core Operating Limits Report (COLR) for each operating cycle.

ENCLOSURE 3

TVA-WBN-TS-03-02

REFUELING WATER STORAGE TANK AND COLD LEG
ACCUMULATOR BORON CONCENTRATION CHANGES

CHANGES TO TECHNICAL SPECIFICATION BASES PAGES

AFFECTED PAGES

TS BASES PAGES

TS B 3.5-4
TS B 3.5-26

BASES

APPLICABLE SAFETY ANALYSES (continued)

water volume is the same as the deliverable volume for the accumulators, since the accumulators are emptied, once discharged. The safety analysis assumes values of 7518 gallons and 8191 gallons. To allow for instrument inaccuracy, values of 7630 gallons and 8000 gallons are specified.

The minimum boron concentration setpoint is used in the post LOCA boron concentration calculation. The calculation is performed to ~~assure reactor subcriticality in a post LOCA~~ environment. Of particular interest is the large break LOCA, since no credit is taken for control rod assembly insertion. ~~A reduction in the accumulator minimum boron~~ concentration would produce a subsequent reduction in the available containment sump concentration for post LOCA shutdown and an increase in the maximum sump pH. The maximum boron concentration is used in determining the cold leg to hot leg recirculation injection switchover time and minimum sump pH.

DELETE:

The small break LOCA analysis is performed at the minimum nitrogen cover pressure, since sensitivity analyses have demonstrated that higher nitrogen cover pressure results in a computed peak clad temperature benefit. The maximum nitrogen cover pressure analysis limit of 690 psig prevents accumulator relief valve actuation, and ultimately preserves accumulator integrity. The LOCA analyses support a range of 585 to 690 psig. To account for the accumulator tank design pressure rating, and to allow for instrument accuracy values of $\geq$ 610 psig and $\leq$ 660 psig are specified for the pressure indicator in the main control room.

The effects on containment mass and energy releases from the accumulators are accounted for in the appropriate analyses (Refs. 2 and 4).

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

required volume is a small fraction of the available volume. The deliverable volume limit is set by the LOCA and containment analyses. For the RWST, the deliverable volume is different from the total volume contained since, due to the design of the tank, more water can be contained than can

**INSERT:**

Technical Specification Surveillance Requirements 3.5.1.4, "Accumulators," and 3.5.4.3, "RWST," allow a range of boron concentrations depending upon the number of tritium producing absorbers rods (TPBARs) installed in the reactor core. The number of TPBARs loaded may vary from minimum of 0 to a maximum of 2304 TPBARs. Generally, TPBARs act as burnable absorber rods normally found in similar reactor core designs. However, unlike burnable absorber rods which lose their poison effects over the life of the cycle, some residual effect remains in the TPBARs at the end of the cycle. When larger amounts of excess neutron poisons (as in the case with larger loads of TPBARs) are added to a core, there is competition for neutrons from all the poison and the negative worth of each poison (including the reactor coolant system (RCS) boron) decreases. The positive reactivity insertion due to the negative moderator coefficient that occurs during the cooldown from hot full power to cold conditions following a loss of coolant accident (LOCA) must be overcome by RCS boron. Because the RCS boron is worth less, it takes a higher concentration to maintain subcriticality.

results show that the departure from nucleate boiling design basis is met. The delay has been established as 27 seconds, with offsite power available, or 37 seconds without offsite power.

For a large break LOCA analysis, the minimum water volume limit of 370,000 gallons and the lower boron concentration limit of 3600 ppm are used to compute the post LOCA sump boron concentration necessary to assure subcriticality. The large break LOCA is the limiting case since the safety analysis assumes that all control rods are out of the core.

The upper limit on boron concentration of 3800 ppm is used to determine the maximum allowable time to switch to hot leg recirculation following a LOCA. The purpose of switching from cold leg to hot leg injection is to avoid boron precipitation in the core following the accident.

**REPLACE WITH:**

For a large break LOCA analysis, the minimum water volume limit of 370,000 gallons and the minimum boron concentration limit is used to compute the post LOCA sump boron concentration necessary to assure subcriticality. This minimum value depends on the number of TPBARs in the core as specified in the Core Operating Limits Report (COLR) for each operating cycle. The large break LOCA is the limiting case since the safety analysis assumes least negative reactivity insertion.

(continued)