CP&L
A Progress Energy Company

James Scarola
Vice President
Harris Nuclear Plant

SERIAL: HNP-01-059
10CFR50.4

APR 2 6 2001

United States Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, DC 20555

SHEARON HARRIS NUCLEAR POWER PLANT
DOCKET NO. 50-400/LICENSE NO. NPF-63
STEAM GENERATOR REPLACEMENT
LICENSE AMENDMENT REQUEST
ERRATA SHEETS

Dear Sir or Madam:

By letter dated October 4, 2000, Carolina Power & Light Company (CP&L) submitted a license amendment request for changes to the Technical Specifications associated with the replacement of steam generators at the Harris Nuclear Plant (HNP). Since the date of this submittal, an error was identified in the accumulator volume used in the Long Term Core Cooling (LTCC)/Hot Leg Switchover (HLSO) analysis that was performed in support of the HNP steam generator replacement and power uprate program. The LTCC/HLSO calculation has been revised to correct the accumulator water volume error. The revised analysis resulted in a more conservative post-LOCA sump boron concentration curve; however, the maximum HLSO time of 8.5 hours and the cycling time between hot leg and cold leg recirculation of 14 hours remain applicable.

The changes to the calculation also resulted in changes to pages 6.1-40 and 6.1-42 of the NSSS Licensing Report previously provided as Enclosure 6 to our October 4, 2000 submittal. The marked-up and retyped pages are provided as Enclosure 1 to this letter. Please replace pages 6.1-40 and 6.1-42 in the October 4, 2000 submittal package with the enclosed retyped pages.

The marked-up and retyped errata sheets are also enclosed for the Westinghouse reports, WCAP-15398 (Westinghouse Proprietary) and WCAP-15399 (Westinghouse Non-proprietary), which were previously provided as Enclosures 8 and 9, respectively, to our October 4, 2000 submittal. The errata sheets (Enclosures 2 and 3 to this letter) supersede the original transmittal of this information. The Westinghouse "Application for Withholding Proprietary Information from Public Disclosure" (CAW-00-1415) with Affidavit CAW-00-1415 remains applicable to these errata sheets.

P.O. Box 165
New Hill, NC 27562

T > 919.362.2502
F > 919.362.2095

A001

The enclosed information is provided as a supplement to our October 4, 2000 submittal and does not change the purpose or scope of the submittal, nor does it change our initial determination that the proposed license amendment represents a no significant hazards consideration.

Please refer any questions regarding the enclosed information to Mr. Eric McCartney at (919) 362-2661.

Sincerely,

James Scarola
Vice President
Harris Nuclear Plant

James Scarola, having been first duly sworn, did depose and say that the information contained herein is true and correct to the best of his information, knowledge, and belief, and the sources of his information are employees, contractors, and agents of Carolina Power & Light Company.

Notary (Seal)

DARLENE S. YARBOROUGH
NOTARY
***
PUBLIC
HARNETT COUNTY, NC

My commission Expires: 2-21-2005

KWS/kws

Enclosures:

1) Errata sheets for Enclosure 6 to HNP-00-142, dated October 4, 2000
2) Errata sheets for WCAP-15398 (Proprietary)
3) Errata sheets for WCAP-15399 (Non-proprietary)

c: Mr. J. B. Brady, NRC Senior Resident Inspector
Mr. Mel Fry, NCDENR
Mr. R. J. Laufer, NRC Project Manager
Mr. L. A. Reyes, NRC Regional Administrator

bc:

Ms. D. B. Alexander
Mr. G. E. Attarian
Mr. R. H. Bazemore
Mr. L. R. Beller (BNP)
Mr. C. L. Burton
Mr. J. R. Caves
Mr. H. K. Chernoff (RNP)
Mr. W. F. Conway
Mr. G. W. Davis
Mr. J. W. Donahue
Mr. R. J. Duncan II
Mr. R. J. Field
Mr. W. J. Flanagan
Mr. K. N. Harris
Ms. L. N. Hartz
Mr. W. J. Hindman
Mr. C. S. Hinnant
Mr. J. W. Holt
Mr. M. T. Janus
Mr. W. D. Johnson
Ms. T. A. Hardy (PE&RAS File)
Mr. R. D. Martin
Mr. T. C. Morton
Mr. W. M. Peavyhouse
Mr. J. M. Taylor
Nuclear Records
Harris Licensing File

SHEARON HARRIS NUCLEAR POWER PLANT
DOCKET NO. 50-400/LICENSE NO. NPF-63
STEAM GENERATOR REPLACEMENT
LICENSE AMENDMENT REQUEST
ERRATA SHEETS

ERRATA SHEETS FOR ENCLOSURE 6 TO HNP-00-142, DATED OCTOBER 4, 2000

(4 Sheets)

curve can be generated for the highest reasonable postulated peak to equilibrium xenon RCS boron ratio for the particular core design considered.

6.1.3.2 Description of Analyses and Evaluations

The minimum MMSBC is calculated by assuming that all available post-LOCA boron sources to the sump are at minimum volumes, masses, and boron concentrations, while all dilution sources to the sump are at maximum volumes, masses, and minimum (0 ppm) boron concentration.

6.1.3.3 Acceptance Criteria

The acceptance criterion for the LTCC post-LOCA sump boron calculation is that the core design must remain such that the minimum post-LOCA sump boron concentration remains sufficient to preclude a return to criticality in the long term post-LOCA.

6.1.3.4 Results

Mixed Mean Sump Boron Calculation: The results were tabulated for RCS boron concentration of 0 and 1500 ppm assuming the pre-trip RCS boron concentration for peak xenon concentration to be 100 ppm lower than the equilibrium xenon case. The straight-line curve (See Figure 6.1.3-1.) fit for the two points provided above is:

$$y = \overset{0.20142}{\cancel{0.20969}}\,x + \underset{1861.46}{\cancel{1839.35}}$$

An alternate equation is provided below where "n" is the difference in boron concentration between the peak and equilibrium xenon concentration case.

$$y = \overset{0.20142}{\cancel{0.20969}}\,x + \overset{0.03653}{\cancel{0.038036}}\,n + \overset{1857.81}{\cancel{1835.542}}$$

6.1.3.5 Conclusions

The Westinghouse licensing position for satisfying the requirements of 10CFR50.46 Paragraph (b) Item (5), "Long-Term Cooling" is documented in Reference 1. The Westinghouse position is that the core will remain subcritical post-LOCA by borated water from various ECCS water sources residing in the RCS and containment sump. Since credit for control rod insertion is not taken for large-break LOCA, the borated ECCS water provided by the accumulators and RWST must have a sufficiently high boron concentration so that, when mixed with other sources of borated and non-borated water, the core will remain subcritical, assuming that all control rods remain withdrawn from the core.

The revised post-LOCA long-term core cooling boron limit curve is used for cycle-specific core designs to ensure post-LOCA subcriticality for either the current NSSS power of 2787.4 MWt or the uprated NSSS power of 2912.4 MWt with the Model Delta 75 replacement steam generators.

curve can be generated for the highest reasonable postulated peak to equilibrium xenon RCS boron ratio for the particular core design considered.

6.1.3.2 Description of Analyses and Evaluations

The minimum MMSBC is calculated by assuming that all available post-LOCA boron sources to the sump are at minimum volumes, masses, and boron concentrations, while all dilution sources to the sump are at maximum volumes, masses, and minimum (0 ppm) boron concentration.

6.1.3.3 Acceptance Criteria

The acceptance criterion for the LTCC post-LOCA sump boron calculation is that the core design must remain such that the minimum post-LOCA sump boron concentration remains sufficient to preclude a return to criticality in the long term post-LOCA.

6.1.3.4 Results

Mixed Mean Sump Boron Calculation: The results were tabulated for RCS boron concentration of 0 and 1500 ppm assuming the pre-trip RCS boron concentration for peak xenon concentration to be 100 ppm lower than the equilibrium xenon case. The straight-line curve (See Figure 6.1.3-1.) fit for the two points provided above is:

$$y = 0.20142\,x + 1861.46$$

An alternate equation is provided below where "n" is the difference in boron concentration between the peak and equilibrium xenon concentration case.

$$y = 0.20142\,x + 0.03653\,n + 1857.81$$

6.1.3.5 Conclusions

The Westinghouse licensing position for satisfying the requirements of 10CFR50.46 Paragraph (b) Item (5), "Long-Term Cooling" is documented in Reference 1. The Westinghouse position is that the core will remain subcritical post-LOCA by borated water from various ECCS water sources residing in the RCS and containment sump. Since credit for control rod insertion is not taken for large-break LOCA, the borated ECCS water provided by the accumulators and RWST must have a sufficiently high boron concentration so that, when mixed with other sources of borated and non-borated water, the core will remain subcritical, assuming that all control rods remain withdrawn from the core.

The revised post-LOCA long-term core cooling boron limit curve is used for cycle-specific core designs to ensure post-LOCA subcriticality for either the current NSSS power of 2787.4 MWt or the uprated NSSS power of 2912.4 MWt with the Model Delta 75 replacement steam generators.

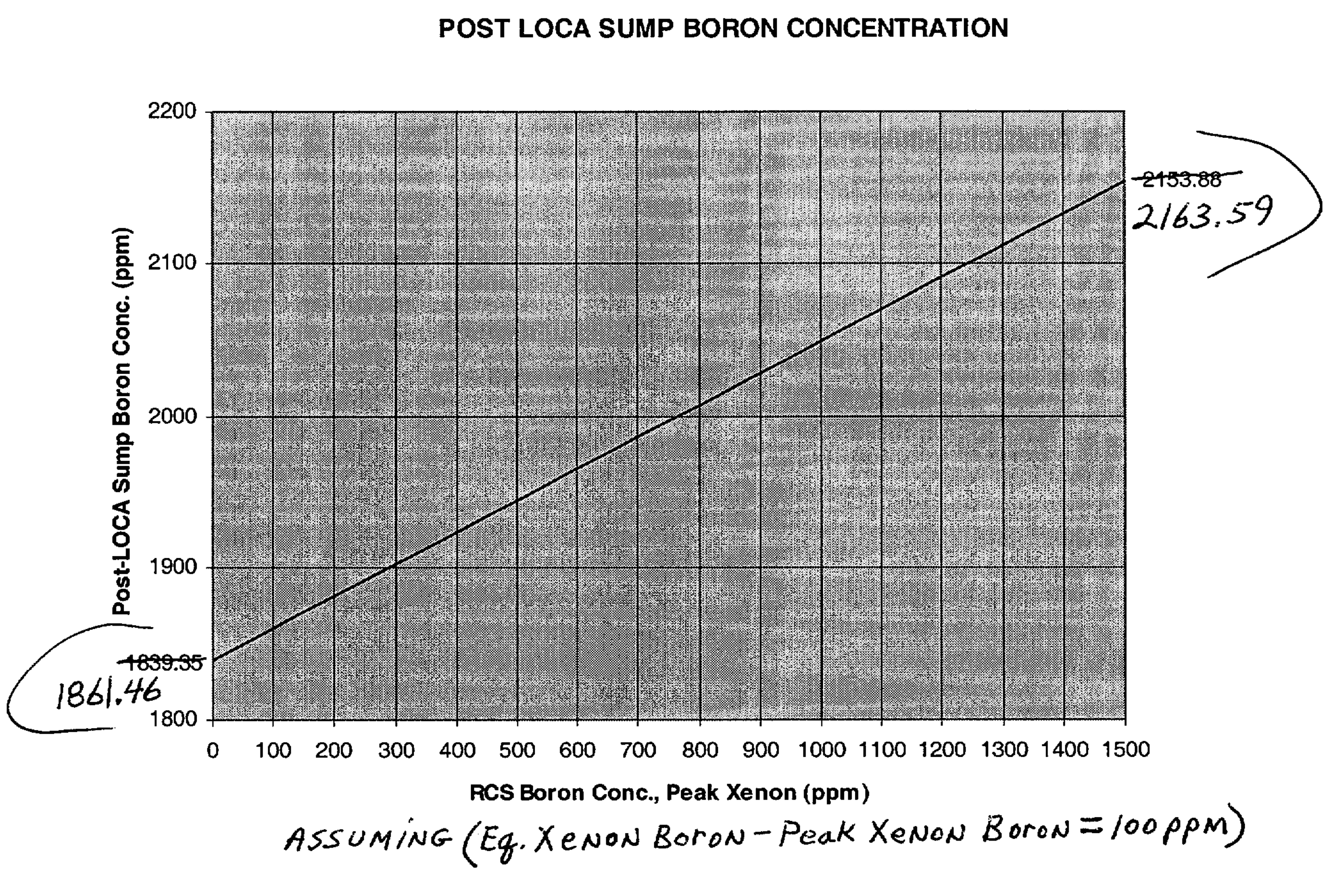

Figure 6.1.3-1 Post-LOCA Sump Boron Concentration

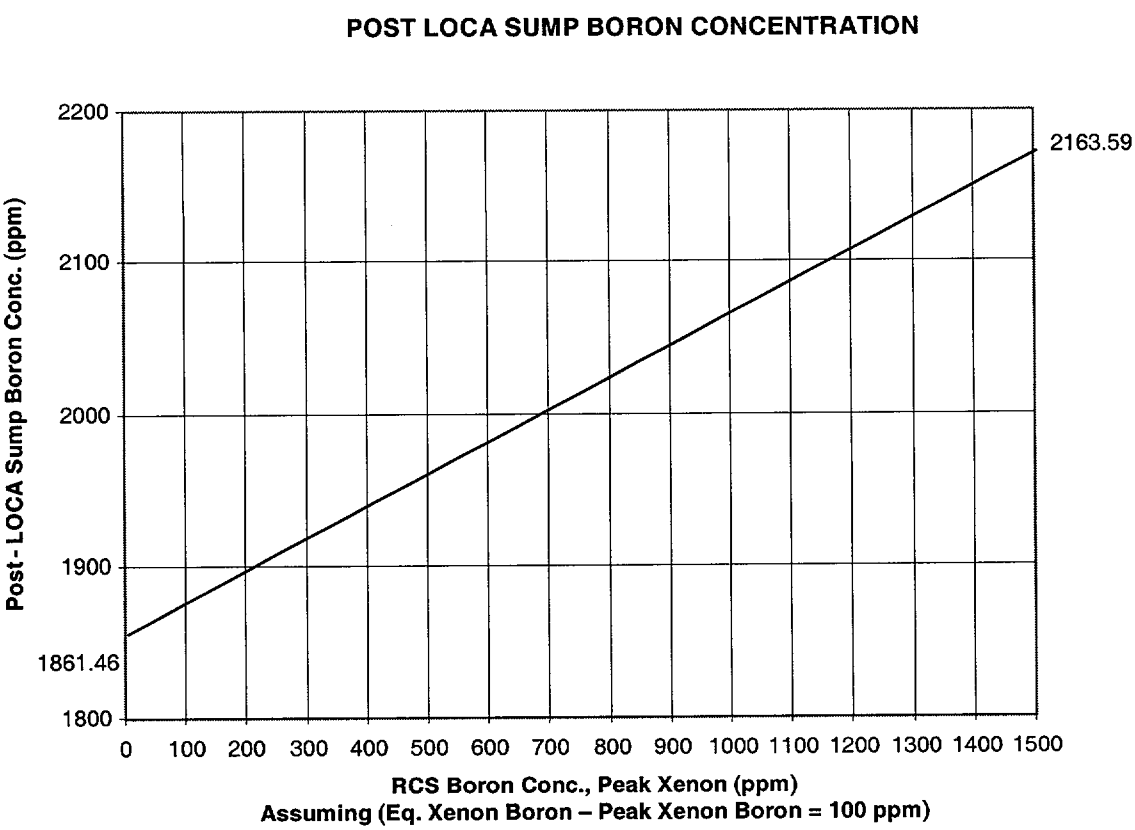

Figure 6.1.3-1 Post - LOCA Sump Boron Concentration

SHEARON HARRIS NUCLEAR POWER PLANT
DOCKET NO. 50-400/LICENSE NO. NPF-63
STEAM GENERATOR REPLACEMENT
LICENSE AMENDMENT REQUEST
ERRATA SHEETS

ERRATA SHEETS FOR WCAP-15399 (Non-proprietary)

(6 Sheets)

To generate the mixed mean sump boron curve, the pre-trip RCS boron concentration for peak-xenon conditions is assumed to be 100 ppm lower than the equilibrium xenon case. The equation that generates the mixed mean sump boron curve is also expressed so that an equivalent curve can be generated for the highest reasonable postulated peak to equilibrium xenon RCS boron ratio for the particular core design considered.

6.1.3.2 Description of Analyses and Evaluations

The minimum MMSBC is calculated by assuming that all available post-LOCA boron sources to the sump are at minimum volumes, masses, and boron concentrations, while all dilution sources to the sump are at maximum volumes, masses, and minimum (0 ppm) boron concentration. A curve is generated for the sump boron based on the various specified initial RCS boron concentrations. This curve is then used to verify that recriticality cannot occur post-LOCA for the MMSBC associated with the particular core designs used on a cycle-specific basis.

6.1.3.3 Acceptance Criteria

The acceptance criteria for the LTCC post-LOCA sump boron calculation is that the core design must remain such that the minimum post-LOCA sump boron concentration remains sufficient to preclude a return to criticality in the long term post-LOCA.

6.1.3.4 Results

The results of the LTCC hot-leg switchover time calculation are presented below.

Mixed Mean Sump Boron Calculation: The results were tabulated for RCS boron concentration of 0 and 1500 ppm assuming the pre-trip RCS boron concentration for peak xenon concentration to be 100 ppm lower than the equilibrium xenon case. The straight-line curve fit for the two points provided above is:

$$y = \overset{0.20142}{\cancel{0.20969}}\, x + \overset{1861.46}{\cancel{1839.35}}$$

An alternate equation is provided below where "n" is the difference in boron concentration between the peak and equilibrium xenon concentration case. (See Figure 6.1.3-1.)

$$y = \overset{0.20142}{\cancel{0.20969}}\, x + \overset{0.03653}{\cancel{0.038036}}\, n + \overset{1857.81}{\cancel{1835.542}}$$

6.1.3.5 Conclusions

The Westinghouse licensing position for satisfying the requirements of 10CFR50.46 Paragraph (b) Item (5), "Long-Term Cooling" is documented in Reference 1. The Westinghouse position is that the core will remain subcritical post-LOCA by borated water from various ECCS water sources residing in the RCS and containment sump. Since credit for control rod insertion

To generate the mixed mean sump boron curve, the pre-trip RCS boron concentration for peak-xenon conditions is assumed to be 100 ppm lower than the equilibrium xenon case. The equation that generates the mixed mean sump boron curve is also expressed so that an equivalent curve can be generated for the highest reasonable postulated peak to equilibrium xenon RCS boron ratio for the particular core design considered.

6.1.3.2 Description of Analyses and Evaluations

The minimum MMSBC is calculated by assuming that all available post-LOCA boron sources to the sump are at minimum volumes, masses, and boron concentrations, while all dilution sources to the sump are at maximum volumes, masses, and minimum (0 ppm) boron concentration. A curve is generated for the sump boron based on the various specified initial RCS boron concentrations. This curve is then used to verify that recriticality cannot occur post-LOCA for the MMSBC associated with the particular core designs used on a cycle-specific basis.

6.1.3.3 Acceptance Criteria

The acceptance criteria for the LTCC post-LOCA sump boron calculation is that the core design must remain such that the minimum post-LOCA sump boron concentration remains sufficient to preclude a return to criticality in the long term post-LOCA.

6.1.3.4 Results

The results of the LTCC hot-leg switchover time calculation are presented below.

Mixed Mean Sump Boron Calculation: The results were tabulated for RCS boron concentration of 0 and 1500 ppm assuming the pre-trip RCS boron concentration for peak xenon concentration to be 100 ppm lower than the equilibrium xenon case. The straight-line curve fit for the two points provided above is:

$$y = 0.20142\,x + 1861.46$$

An alternate equation is provided below where "n" is the difference in boron concentration between the peak and equilibrium xenon concentration case. (See Figure 6.1.3-1.)

$$y = 0.20142\,x + 0.03653\,n + 1857.81$$

6.1.3.5 Conclusions

The Westinghouse licensing position for satisfying the requirements of 10CFR50.46 Paragraph (b) Item (5), "Long-Term Cooling" is documented in Reference 1. The Westinghouse position is that the core will remain subcritical post-LOCA by borated water from various ECCS water sources residing in the RCS and containment sump. Since credit for control rod insertion

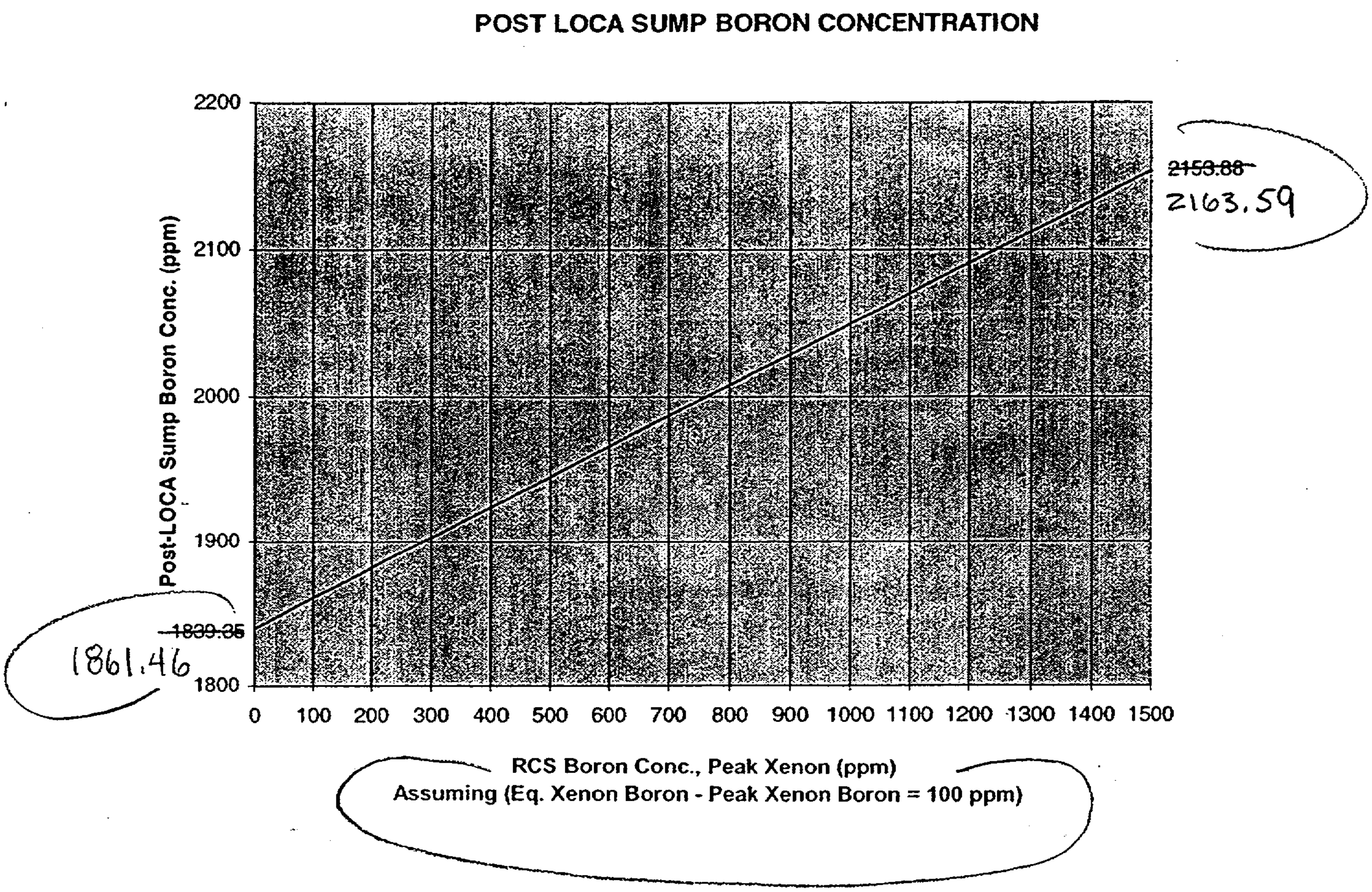

Figure 6.1.3-1 Post-LOCA Sump Boron Concentration

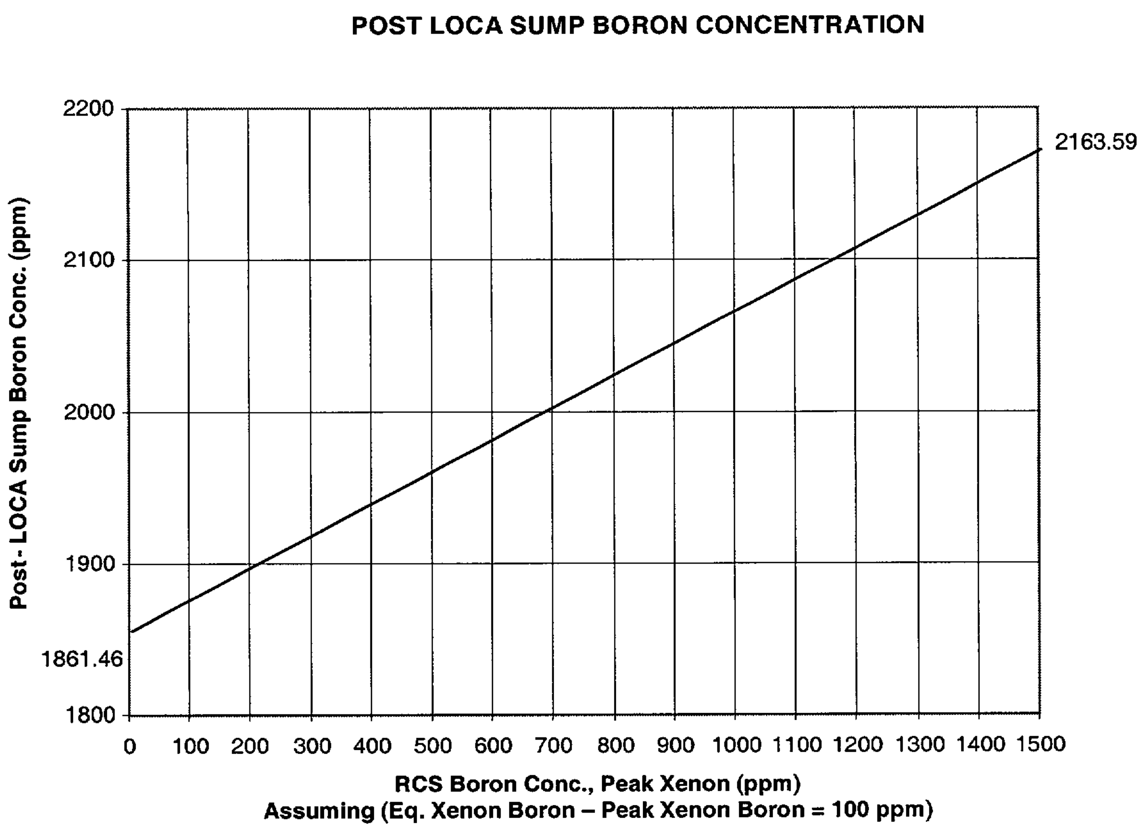

Figure 6.1.3-1 Post-LOCA Sump Boron Concentration

4.1.4 Residual Heat Removal System

ORIG SHEET MARK-UP

4.1.4.1 RHR Cooldown Analysis

4.1.4.1.1 Introduction

The Residual Heat Removal System (RHRS) is a dual-function system. During normal power operation, the system is in a stand-by mode to support its Engineered Safeguards function (i.e., safety injection). During the second phase of plant cooldown and the plant shutdown mode of operation, the RHRS is used to remove RCS sensible and core decay heat. The auxiliary feedwater and main steam systems are used for the RCS heat removal during the first phase of plant cooldown and may supplement the second phase of plant cooldown. This section discusses the RHRS normal functions (i.e., heat removal). The Engineered Safeguards functions of the RHRS are discussed in Section 4.1.3, Safety Injection System.

The RHRS is comprised of two centrifugal pumps, two heat exchangers, interconnecting piping and instrumentation. With the RHRS in operation, each RHR pump takes suction from an RCS hot leg and recirculates the flow back to each of the RCS cold legs. System flow passes through the tube side of the RHR heat exchangers (shell and tube design). Cooling flow to the RHR heat exchangers (shell side) is provided via the Component Cooling Water System (CCWS), which in turn, is cooled by the Service Water (SW) System. The CCWS is comprised of three pumps and TWO ~~three~~ heat exchangers. Normally, two CCW pumps and two CCW heat exchangers are in service during cooldown.

In addition, the RHRS is equipped with two relief valves for protection against overpressurization. (Note that Section 4.3.1.5 discusses the LTOP analysis and the use of the RHR relief valves to protect the RCS against overpressure events at low temperatures.)

The maximum heat removal demand on the RHRS occurs during the plant cooldown mode of operation when RCS sensible heat (e.g., metal mass), core decay heat, and heat input from a Reactor Coolant Pump (RCP) must all be removed to support RCS cooldown. In addition, operating restrictions are imposed on the maximum allowable CCWS temperature and flow during cooldown, which can also restrict RHRS heat removal capability.

The overall RHRS heat removal capability can vary significantly depending on system equipment availability, cooling support system equipment availability, cooling support system flows, and SW system inlet temperature. In general, RHRS thermal heat removal capability becomes more restricted when operating conditions change as outlined below.

- Higher RCS heat loads
- Lower RHRS flows
- Lower CCWS flow to the RHRS heat exchanger

4.1.4 Residual Heat Removal System

4.1.4.1 RHR Cooldown Analysis

4.1.4.1.1 Introduction

The Residual Heat Removal System (RHRS) is a dual-function system. During normal power operation, the system is in a stand-by mode to support its Engineered Safeguards function (i.e., safety injection). During the second phase of plant cooldown and the plant shutdown mode of operation, the RHRS is used to remove RCS sensible and core decay heat. The auxiliary feedwater and main steam systems are used for the RCS heat removal during the first phase of plant cooldown and may supplement the second phase of plant cooldown. This section discusses the RHRS normal functions (i.e., heat removal). The Engineered Safeguards functions of the RHRS are discussed in Section 4.1.3, Safety Injection System.

The RHRS is comprised of two centrifugal pumps, two heat exchangers, interconnecting piping and instrumentation. With the RHRS in operation, each RHR pump takes suction from an RCS hot leg and recirculates the flow back to each of the RCS cold legs. System flow passes through the tube side of the RHR heat exchangers (shell and tube design). Cooling flow to the RHR heat exchangers (shell side) is provided via the Component Cooling Water System (CCWS), which in turn, is cooled by the Service Water (SW) System. The CCWS is comprised of three pumps and two heat exchangers. Normally, two CCW pumps and two CCW heat exchangers are in service during cooldown.

In addition, the RHRS is equipped with two relief valves for protection against overpressurization. (Note that Section 4.3.1.5 discusses the LTOP analysis and the use of the RHR relief valves to protect the RCS against overpressure events at low temperatures.)

The maximum heat removal demand on the RHRS occurs during the plant cooldown mode of operation when RCS sensible heat (e.g., metal mass), core decay heat, and heat input from a Reactor Coolant Pump (RCP) must all be removed to support RCS cooldown. In addition, operating restrictions are imposed on the maximum allowable CCWS temperature and flow during cooldown, which can also restrict RHRS heat removal capability.

The overall RHRS heat removal capability can vary significantly depending on system equipment availability, cooling support system equipment availability, cooling support system flows, and SW system inlet temperature. In general, RHRS thermal heat removal capability becomes more restricted when operating conditions change as outlined below.

- Higher RCS heat loads
- Lower RHRS flows
- Lower CCWS flow to the RHRS heat exchanger