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A. Edward Scherer
Manager of
Nuclear Regulatory Affairs

December 15, 2003

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

Subject: **Docket Nos. 50-361 and 50-362**
2002 Emergency Core Cooling System Annual 10 CFR 50.46 Report
San Onofre Nuclear Generating Station, Units 2 and 3

References:
1. SCE letter to NRC dated August 12, 2002, Subject: Docket Nos. 50-361 and 50-362, 2001 Emergency Core Cooling System Annual 10 CFR 50.46 Report, San Onofre Nuclear Generating Station, Units 2 and 3
2. CENPD-279, Supplement 14, Rev. 1, Annual Report on Combustion Engineering ECCS Performance Evaluation Models for PWRs, April 2003
3. DAR-OA-03-14, Rev. 0, Annual Report on Combustion Engineering ECCS Performance Evaluation Models for SONGS Units 2 and 3, April 2003

Gentlemen:

This letter transmits, as Enclosures 1, 2, and 3, the San Onofre Units 2 and 3 annual report for the 2002 calendar year required by paragraph (a)(3)(ii) of 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors." This regulation requires Southern California Edison (SCE) to annually report to the NRC for San Onofre Units 2 and 3 the nature of each change to or error discovered in the Emergency Core Cooling System (ECCS) evaluation model or in the application of this model that affects the temperature calculation and estimated effects of any such changes, errors, or applications on the limiting ECCS analysis. Any significant change or error is required to be reported to the NRC within 30 days.

The most recent Emergency Core Cooling System Annual 10 CFR 50.46 Report was submitted to the NRC in Reference 1.

A001

P.O. Box 128
San Clemente, CA 92674-0128
949-368-7501
Fax 949-368-7575

References 2 and 3 (included in Enclosures 1 and 2) describe the codes and methodology used by Westinghouse Electric Company for the San Onofre Units 2 and 3 ECCS analysis for this reporting period (Westinghouse currently provides ECCS evaluation model reports for PWRs originally developed by Combustion Engineering). Reference 2, Appendix C summarizes the plant specific evaluation for San Onofre Units 2 and 3. Appendices A, B, D, E, F, and G of Reference 2 apply to plants other than San Onofre and, therefore, are not included. Reference 3 is the revised plant specific evaluation for San Onofre Units 2 and 3 correcting an error in Reference 2.

SCE made no changes to the Loss of Coolant Accident (LOCA) evaluation models.

Enclosure 3 provides a summary of the effect on Peak Cladding Temperature (PCT) of the errors or changes to the ECCS evaluation model reported under 10 CFR 50.46 for this reporting period. While not limiting with regard to PCT, detailed information for the small break LOCA is also included in Enclosure 3 (in accordance with Supplement 1 to Information Notice 97-15).

Operating Cycle Information

Unit 2 and Unit 3 operation for the current reporting period is outlined below.

Unit	Year	Cycle 11	Cycle 12
2	2002	January 1, 2002 to May 20, 2002	July 2, 2002 to December 31, 2002
3	2002	January 1, 2002 to December 31, 2002	N/A

San Onofre Units 2 & 3 Large Break LOCA Evaluation Model - **2002 Reporting Period**

The Large Break LOCA analysis uses the evaluation model approved in June 1985. The limiting large break LOCA PCT did not exceed the 10 CFR 50.46(b)(1) acceptance criterion of 2200 °F. This is documented in Table 1 (Enclosure 3).

The cumulative (sum of the absolute magnitudes of PCT changes) Large Break LOCA 10 CFR 50.46 model changes and model errors, since the approval of the "June 1985 Evaluation Model," remains less than 1 °F. This is documented in Table 2 (Enclosure 3).

San Onofre Units 2 & 3 Small Break LOCA Evaluation Model - **2002 Reporting Period**

The Small Break LOCA analysis uses the ABB-Combustion Engineering Supplement 2 Model (S2M) evaluation model approved on February 22, 2000. The limiting small break LOCA PCT did not exceed the 10 CFR 50.46(b)(1) acceptance criterion of 2200 °F and remained bounded by the large break LOCA PCT. This is documented in Table 3 (Enclosure 3).

The cumulative (sum of the absolute magnitudes of PCT changes) Small Break LOCA 10 CFR 50.46 model changes and model errors, since the approval of the "S2M Evaluation Model," is 19 °F. This includes a 3 °F error for 2002 which Westinghouse has described as a plant data error. SCE has conservatively included this error as a model error. This is documented in Table 4 (Enclosure 3).

An authorization for the NRC to reproduce the copyrighted References 2 and 3 is provided in Enclosures 1 and 2 in the "Copyright Notice" Section.

If you have any questions or need additional information on this subject, please let me know.

Sincerely,

Enclosures

cc: B. S. Mallett, Regional Administrator, NRC Region IV
B. M. Pham, NRC Project Manager, San Onofre Units 2, and 3
C. C. Osterholtz, NRC Senior Resident Inspector, San Onofre Units 2 & 3

Enclosure 1

CENPD-279
Supplement 14, Rev. 1

ANNUAL REPORT ON COMBUSTION ENGINEERING ECCS PERFORMANCE EVALUATION MODELS for PWRs

April 2003

Westinghouse Electric Company LLC

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ABSTRACT

This report describes changes and errors in the ECCS performance evaluation models for PWRs developed by Combustion Engineering in calendar year (CY) 2002 per the requirements of 10CFR50.46. For this reporting period, errors were found in the evaluation models (EM) or application of the models that affect the cladding temperature calculation. In particular, errors in the STRIKIN-II code used in the large break LOCA evaluation models were found and corrected.

The sum of the absolute magnitude of the generic peak cladding temperature (PCT) changes for the large break LOCA June 1985 EM from all reports to date continues to be less than 1°F excluding plant specific effects. The generic impact on the peak cladding temperature for the large break LOCA 1999 EM is less than 1.2°F. The generic sum of the absolute magnitude of the peak cladding temperature changes for the small break LOCA S1M evaluation model from all reports to date is less than 3°F. There is no generic accumulated change in peak cladding temperature for the small break LOCA S2M evaluation model. No change occurred in the PCT due to post-LOCA long term cooling issues. The total effect relative to the 50°F definition of a significant change in PCT for each evaluation model is the sum of the generic effects for that model and plant specific effects, if any, described in Appendices A-G.

TABLE OF CONTENTS

1.0 INTRODUCTION

This report addresses the NRC requirement to report changes or errors in ECCS performance evaluation models. The ECCS Acceptance Criteria, Reference 1, spell out reporting requirements and actions required when errors are corrected or changes are made in an evaluation model or in the application of a model for an operating licensee or construction permittee of a nuclear power plant.

The action requirements in 10CFR50.46(a)(3) are:

1. Each applicant for or holder of an operating license or construction permit shall estimate the effect of any change to or error in an acceptable evaluation model or in the application of such a model to determine if the change or error is significant. For this purpose, a significant change or error is one which results in a calculated peak fuel cladding temperature (PCT) different by more than 50°F from the temperature calculated for the limiting transient using the last acceptable model, or is a cumulation of changes and errors such that the sum of the absolute magnitudes of the respective temperature changes is greater than 50°F.

2. For each change to or error discovered in an acceptable evaluation model or in the application of such a model that affects the temperature calculation, the applicant or licensee shall report the nature of the change or error and its estimated effect on the limiting ECCS analysis to the Commission at least annually as specified in 10CFR50.4.

3. If the change or error is significant, the applicant or licensee shall provide this report within 30 days and include with the report a proposed schedule for providing a reanalysis or taking other action as may be needed to show compliance with 10CFR50.46 requirements. This schedule may be developed using an integrated scheduling system previously approved for the facility by the NRC. For those facilities not using an NRC approved integrated scheduling system, a schedule will be established by the NRC staff within 60 days of receipt of the proposed schedule.

4. Any change or error correction that results in a calculated ECCS performance that does not conform to the criteria set forth in paragraph (b) of 10CFR50.46 is a reportable event as described in 10CFR50.55(e), 50.72 and 50.73. The affected applicant or licensee shall propose immediate steps to demonstrate compliance or bring plant design or operation into compliance with 10CFR50.46 requirements.

This report documents all the errors corrected in and/or changes to the presently licensed ECCS performance evaluation models for PWRs developed by Combustion Engineering, made in the

year covered by this report, which have not been reviewed by the NRC staff. This document is provided to satisfy the reporting requirements of the second item above. Reports for earlier years are given in References 2-15.

2.0 COMBUSTION ENGINEERING ECCS EVALUATION MODELS AND CODES

Five evaluation models (EM) for ECCS performance analysis of PWRs developed by Combustion Engineering are described in topical reports, are licensed by the NRC, and are covered by the provisions of 10CFR50.46. The evaluation models for large break LOCA (LBLOCA) are the June 1985 EM and the 1999 EM. There are two evaluation models for small break LOCA (SBLOCA): the SBLOCA Evaluation Model (S1M) and the S2M SBLOCA EM. Post-LOCA long term cooling (LTC) analyses are performed with the LTC evaluation model.

Several digital computer codes are used to do ECCS performance analyses of PWRs for the evaluation models described above that are covered by the provisions of 10CFR50.46. Those for LBLOCA calculations are CEFLASH-4A, COMPERC-II, HCROSS, PARCH, STRIKIN-II, and COMZIRC. CEFLASH-4AS is used in conjunction with COMPERC-II, STRIKIN-II, and PARCH for SBLOCA calculations. The codes for post-LOCA LTC analyses are BORON, CEPAC, NATFLOW, and CELDA.

3.0 EVALUATION MODEL CHANGES AND ERROR CORRECTIONS

This section discusses all error corrections and model changes to the ECCS performance evaluation models for PWRs described in Section 2.0 that may affect the calculated PCT.

3.1 STRIKIN-II Code Errors

Errors in the implementation of the time step algorithm and the Coffman plastic strain model were identified and corrected in 2002.

3.1.1 Time Step Algorithm

The algorithms used in the automatic time step selection method for STRIKIN-II are described in Appendix C of Reference 16. They are designed to automatically adjust the time step length such that STRIKIN-II calculates an appropriate solution for the fuel, cladding and coolant temperature and the heat flux to the coolant by limiting the Courant number. They are designed to ensure that the Courant number, R_j, defined for Eq. II.2-6 in Reference 17, never exceeds 1.0 which ensures conservation of energy. That is,

$$R_j \equiv G_j \bullet \Delta t / (\rho_j \bullet \Delta z) \leq 1.0$$

where

G_j = Mass flux at axial node j (lbm/ft^2-sec)
Δt = Time step interval (sec)
ρ_j = Coolant density at axial node j (lbm/ft^3)
Δz = Axial node length (ft).

While the numerical limit for the Courant number is 1.0, the time step algorithm in STRIKIN-II further limits it to a value of 0.5. An error in the implementation of the algorithm bypassed this test which could allow the Courant number to exceed the normal limit. This error was corrected.

An additional problem that could produce a Courant number greater than 1.0 was found with the implementation of a user input for the minimum time step length. When the user input for the minimum time step is less than the value calculated by the automatic time step algorithm, the minimum time step length is used. An error test was added to stop the code with an error message if the minimum time step specified by the user would allow the Courant number to exceed 0.99.

3.1.2 Coffman Plastic Strain Model for Cladding

A problem with the implementation of the Coffman plastic strain model for fuel cladding in STRIKIN-II was discovered. The model is only used when the heating rate and the cladding temperature are within bounds set for application of the model. The calculated plastic strain is continuous except when the cladding conditions are outside these bounds and later return within the bounds at a higher cladding temperature. In order to address the resulting discontinuity, a ramp function is used to introduce the strain over several time steps. The problem occurred when the heating rate fell below the lower bound for the model within the time duration of the ramp. This was corrected by terminating the ramp when the conditions for the use of the model described above are not satisfied.

3.1.3 Effect of Correcting STRIKIN-II Errors

Analyses of several plants with the 1985 EM for Zircaloy-4 cladding shows that the effect on PCT is less than |0.2°F|. Analyses of plants with the 1999 EM for Zircaloy-4 and ZIRLO™ cladding show that the effect on cladding PCT is less than |1.2°F|.

4.0 CONCLUSIONS

There were two errors in the ECCS evaluation models for PWRs in CY 2002. Both of the errors were in STRIKIN-II code models that affect the results of LBLOCA analyses using either the 1985 or 1999 EM. The sum of the absolute magnitude of the changes in PCT calculated using the June 1985 EM for LBLOCA, including those from previous annual reports, References 2-15, remains less than 1°F. The total 1985 EM LBLOCA impact on PCT for a given plant remains <1°F. The maximum impact on PCT with the 1999 EM is less than 1.2°F. Plant specific LBLOCA considerations for each plant are discussed in Appendices A through G.

There are no errors for SBLOCA in CY 2002. Previous plant specific PCT effects for both the S1M and S2M SBLOCA evaluation models are discussed in Appendices A through G of Reference 15. In addition, there is a generic effect on maximum cladding temperature for the SBLOCA S1M (due to the change in application of the SBLOCA S1M described in Reference 11) that is less than 3°F. There is no previous accumulated change in cladding temperature for the S2M.

There is no PCT effect for the post-LOCA long term cooling evaluation model.

5.0 REFERENCES

1. "Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Reactors," Code of Federal Regulations, Title 10, Part 50, Section 50.46.
2. "Annual Report on C-E ECCS Codes and Methods for 10CFR50.46," CENPD-279, April, 1989.
3. "Annual Report on C-E ECCS Codes and Methods for 10CFR50.46," CENPD-279, Supplement 1, February, 1990.
4. "Annual Report on C-E ECCS Codes and Methods for 10CFR50.46," CENPD-279, Supplement 2, April, 1991.
5. "Annual Report on C-E ECCS Codes and Methods for 10CFR50.46," CENPD-279, Supplement 3, April, 1992.
6. "Annual Report on C-E ECCS Codes and Methods for 10CFR50.46," CENPD-279, Supplement 4, April, 1993.
7. "Annual Report on C-E ECCS Codes and Methods for 10CFR50.46," CENPD-279, Supplement 5, February, 1994.
8. "Annual Report on ABB C-E ECCS Performance Evaluation Models," CENPD-279, Supplement 6, February, 1995.
9. "Annual Report on ABB C-E ECCS Performance Evaluation Models," CENPD-279, Supplement 7, February, 1996.
10. "Annual Report on ABB CE ECCS Performance Evaluation Models," CENPD-279, Supplement 8, March, 1997.
11. "Annual Report on ABB CE ECCS Performance Evaluation Models," CENPD-279, Supplement 9, February, 1998.
12. "Annual Report on ABB CE ECCS Performance Evaluation Models," CENPD-279, Supplement 10, February, 1999.
13. "Annual Report on ABB CE ECCS Performance Evaluation Models," CENPD-279, Supplement 11, March, 2000.
14. "Annual Report on Combustion Engineering ECCS Performance Evaluation Models for PWRs," CENPD-279, Supplement 12, April, 2001.
15. "Annual Report on Combustion Engineering ECCS Performance Evaluation Models for PWRs," CENPD-279, Supplement 13, Rev. 1, April, 2002.

16. "STRIKIN-II – A Cylindrical Geometry Fuel Rod Heat Transfer Program," CENPD-135-P, Supplement 5, April 1977.

17. "STRIKIN-II, A Cylindrical Geometry Fuel Rod Heat Transfer Program," CENPD-135P, August 1974.

APPENDIX C

SOUTHERN CALIFORNIA EDISON COMPANY

Plant Specific Considerations for SONGS Units 2 and 3

The total effect on PCT due to the STRIKIN-II errors described in Section 3 is less than 1°F for all LBLOCA analyses of SONGS Units 2 and 3 to date that were done with the 1985 EM.

There are no new SBLOCA errors for Calendar Year 2002. Plant specific effects for SBLOCA from previous reports are described in Appendix C of Reference 15.

Enclosure 2

DAR-OA-03-14
Rev. 0

ANNUAL REPORT ON COMBUSTION ENGINEERING ECCS PERFORMANCE EVALUATION MODELS for SONGS Units 2 and 3

April 2003

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ABSTRACT

This report describes changes and errors in the ECCS performance evaluation models for PWRs developed by Combustion Engineering in calendar year (CY) 2002 per the requirements of 10CFR50.46. For this reporting period, errors were found in the evaluation models (EM) or application of the models that affect the cladding temperature calculation. In particular, errors in the STRIKIN-II code used in the large break LOCA evaluation models were found and corrected. In addition, plant specific effects for the SBLOCA results due to a plant data error were identified and corrected.

The sum of the absolute magnitude of the generic peak cladding temperature (PCT) changes for the large break LOCA June 1985 EM from all reports to date continues to be less than 1°F excluding plant specific effects. SONGS Units 2 and 3 have no plant specific effect for LBLOCA. There is no generic accumulated change in peak cladding temperature for the small break LOCA S2M evaluation model. The SBLOCA plant specific effect of a plant data error for SONGS Units 2 and 3 is 3°F. No change occurred in the PCT due to post-LOCA long term cooling issues. The total effect relative to the 50°F definition of a significant change in PCT for each evaluation model is the sum of the generic effects for that model and plant specific effects, if any, described in Appendix C.

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4. Any change or error correction that results in a calculated ECCS performance that does not conform to the criteria set forth in paragraph (b) of 10CFR50.46 is a reportable event as described in 10CFR50.55(e), 50.72 and 50.73. The affected applicant or licensee shall propose immediate steps to demonstrate compliance or bring plant design or operation into compliance with 10CFR50.46 requirements.

This report documents all the errors corrected in and/or changes to the presently licensed ECCS performance evaluation models for PWRs developed by Combustion Engineering, made in the year covered by this report, which have not been reviewed by the NRC staff. This document is provided to satisfy the reporting requirements of the second item above. Reports for earlier years are given in References 2-15.

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ρ_j = Coolant density at axial node j (lbm/ft^3)
Δz = Axial node length (ft).

While the numerical limit for the Courant number is 1.0, the time step algorithm in STRIKIN-II further limits it to a value of 0.5. An error in the implementation of the algorithm bypassed this test which could allow the Courant number to exceed the normal limit. This error was corrected. An additional problem that could produce a Courant number greater than 1.0 was found with the implementation of a user input for the minimum time step length. When the user input for the minimum time step is less than the value calculated by the automatic time step algorithm, the minimum time step length is used. An error test was added to stop the code with an error message if the minimum time step specified by the user would allow the Courant number to exceed 0.99.

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A problem with the implementation of the Coffman plastic strain model for fuel cladding in STRIKIN-II was discovered. The model is only used when the heating rate and the cladding temperature are within bounds set for application of the model. The calculated plastic strain is continuous except when the cladding conditions are outside these bounds and later return within the bounds at a higher cladding temperature. In order to address the resulting discontinuity, a ramp function is used to introduce the strain over several time steps. The problem occurred when the heating rate fell below the lower bound for the model within the time duration of the ramp. This was corrected by terminating the ramp when the conditions for the use of the model described above are not satisfied.

3.1.3 Effect of Correcting STRIKIN-II Errors

Analyses of several plants with the 1985 EM for Zircaloy-4 cladding shows that the effect on PCT is less than |0.2°F|. Analyses of plants with the 1999 EM for Zircaloy-4 and ZIRLO™ cladding show that the effect on cladding PCT is less than |1.2°F|.

4.0 CONCLUSIONS

There were two errors in the ECCS evaluation models for PWRs in CY 2002. Both of the errors were in STRIKIN-II code models that affect the results of LBLOCA analyses using either the 1985 or 1999 EM. The sum of the absolute magnitude of the changes in PCT calculated using the June 1985 EM for LBLOCA, including those from previous annual reports, References 2-15, remains less than 1°F. The total 1985 EM LBLOCA impact on PCT for a given plant remains <1°F. The maximum impact on PCT with the 1999 EM is less than 1.2°F. Plant specific LBLOCA considerations are discussed in Appendix C.

There are no evaluation model or code errors for SBLOCA in CY 2002 nor is there is a previous accumulated cladding temperature effect due to changes in the S2M EM. Previous plant specific PCT effects are discussed in Appendix C of Reference 15. Plant specific SBLOCA considerations for CY 2002 are discussed in Appendix C of this document.

There is no PCT effect for the post-LOCA long term cooling evaluation model.

5.0 REFERENCES

1. "Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Reactors," Code of Federal Regulations, Title 10, Part 50, Section 50.46.
2. "Annual Report on C-E ECCS Codes and Methods for 10CFR50.46," CENPD-279, April, 1989.
3. "Annual Report on C-E ECCS Codes and Methods for 10CFR50.46," CENPD-279, Supplement 1, February, 1990.
4. "Annual Report on C-E ECCS Codes and Methods for 10CFR50.46," CENPD-279, Supplement 2, April, 1991.
5. "Annual Report on C-E ECCS Codes and Methods for 10CFR50.46," CENPD-279, Supplement 3, April, 1992.
6. "Annual Report on C-E ECCS Codes and Methods for 10CFR50.46," CENPD-279, Supplement 4, April, 1993.
7. "Annual Report on C-E ECCS Codes and Methods for 10CFR50.46," CENPD-279, Supplement 5, February, 1994.
8. "Annual Report on ABB C-E ECCS Performance Evaluation Models," CENPD-279, Supplement 6, February, 1995.
9. "Annual Report on ABB C-E ECCS Performance Evaluation Models," CENPD-279, Supplement 7, February, 1996.
10. "Annual Report on ABB CE ECCS Performance Evaluation Models," CENPD-279, Supplement 8, March, 1997.
11. "Annual Report on ABB CE ECCS Performance Evaluation Models," CENPD-279, Supplement 9, February, 1998.
12. "Annual Report on ABB CE ECCS Performance Evaluation Models," CENPD-279, Supplement 10, February, 1999.
13. "Annual Report on ABB CE ECCS Performance Evaluation Models," CENPD-279, Supplement 11, March, 2000.
14. "Annual Report on Combustion Engineering ECCS Performance Evaluation Models for PWRs," CENPD-279, Supplement 12, April, 2001.
15. "Annual Report on Combustion Engineering ECCS Performance Evaluation Models for PWRs," CENPD-279, Supplement 13, Rev. 1, April, 2002.

16. "STRIKIN-II – A Cylindrical Geometry Fuel Rod Heat Transfer Program," CENPD-135-P, Supplement 5, April 1977.

17. "STRIKIN-II, A Cylindrical Geometry Fuel Rod Heat Transfer Program," CENPD-135P, August 1974.

APPENDIX C

SOUTHERN CALIFORNIA EDISON COMPANY

Plant Specific Considerations for SONGS Units 2 and 3

The effect on PCT due to the STRIKIN-II code errors described in Section 3 is less than 1°F for all LBLOCA analyses of SONGS Units 2 and 3 to date that were done with the 1985 EM. A further consideration is an error in the plant geometric data for the LOCA analyses of record. The historic value for the suction leg elevation for SONGS Units 2 and 3 was found to be 4.625 inches high. This has a negligible effect for LBLOCA because the suction leg (complete loop seal region) is lumped into a single homogeneous node for this analysis. The pressure is calculated at the top of the node which is not changed by correcting the elevation error. Therefore, the total effect on PCT for LBLOCA remains less than 1°F for all LBLOCA analyses of SONGS Units 2 and 3 to date that were done with the 1985 EM.

The SBLOCA evaluation model represents the suction leg with two nodes to include the effect of fluid elevation during loop seal clearing. Lowering the suction leg elevation by 4.625 inches slightly delays the time of loop seal clearing which increases the amount of fluid lost out of the break and can possibly increase the PCT. For the SONGS Units 2 and 3 analysis of record, correction of the suction leg elevation error increases PCT by 3°F. This also affects the SBLOCA results in the UFSAR to the same degree.

Plant specific effects for SBLOCA from previous reports are described in Appendix C of Reference 15.

Enclosure 3

2002 REPORTING PERIOD

LOSS OF COOLANT ACCIDENT (LOCA) MARGIN SUMMARY
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 AND 3

Large Break LOCA

Table 1 provides a time line of the items which could affect the large break Loss of Coolant Accident (LOCA) peak cladding temperature (PCT) for this reporting period. The 10 CFR 50.46 PCT limit of 2200°F was not exceeded.

Table 1

Limiting Large Break LOCA PCT

	Unit 2	Unit 3
Limiting Large Break LOCA PCT *End of 2001*	2143 °F	2136 °F
Changes in PCT *during 2002* due to:		
a) Model changes or Model errors		
• Cycle 11	< 1 °F	< 1 °F
• Cycle 12	< 1 °F	N/A
b) Cycle Dependent Input Changes		
• Cycle 11	0 °F	0 °F
• Cycle 12	-8 °F	N/A
Limiting Large Break LOCA PCT *End of 2002*	2135 °F	2136 °F

The cumulative 10 CFR 50.46 model changes and model errors for the "Large Break LOCA June 1985 Evaluation Model" are shown in Table 2.

Table 2

Cumulative LBLOCA 10 CFR 50.46
Model Changes & Model Errors
$\sum |\Delta PCT|$ *

	Unit 2	Unit 3
Cumulative LBLOCA 10 CFR 50.46 Model Changes & Model Errors ***Prior to 2002***	< 1 °F	< 1 °F
Changes in LBLOCA PCT due to Model Changes & Model Errors ***Discovered in 2002***		
• Cycle 11	< 1 °F	< 1 °F
• Cycle 12	< 1 °F	N/A
Cumulative LBLOCA 10 CFR 50.46 Model Changes & Model Errors ***End of 2002***	< 1 °F	< 1 °F

* Sum of the absolute magnitude of the 10 CFR 50.46 model changes and model errors.

Small Break LOCA

Table 3 provides a time line of the items which could affect the small break LOCA peak cladding temperature (PCT) for this reporting period. The SBLOCA 10 CFR 50.46 PCT limit of 2200°F was not exceeded, and remained bounded by the LBLOCA.

Table 3

Limiting Small Break LOCA PCT

	Unit 2	Unit 3
Limiting Small Break LOCA PCT ***End of 2001***	1900 °F	1900 °F
Changes in PCT ***during 2002*** due to:		
a) Model changes or Model errors *		
• Cycle 11	3 °F	3 °F
• Cycle 12	3 °F	N/A
b) Cycle Dependent Input Changes		
• Cycle 11	0 °F	0 °F
• Cycle 12	0 °F	N/A
Limiting Small Break LOCA PCT ***End of 2002***	1903 °F	1903 °F

* The 3 °F error shown for Unit 2 Cycles 11 and 12 is a single error affecting both cycles and not two separate errors.

The cumulative 10 CFR 50.46 model changes and model errors for the "Small Break LOCA S2M Evaluation Model" are shown in Table 4.

Table 4

Cumulative SBLOCA 10 CFR 50.46
Model Changes & Model Errors
$\sum |\Delta \text{PCT}|$ *

	Unit 2	Unit 3
Cumulative SBLOCA 10 CFR 50.46 Model Changes & Model Errors ***Prior to 2002***	16 °F	16 °F
Changes in SBLOCA PCT due to Model Changes & Model Errors ***Discovered in 2002*** ** • Cycle 11 • Cycle 12	 3 °F 3 °F	 3 °F N/A
Cumulative SBLOCA 10 CFR 50.46 Model Changes & Model Errors ***End of 2002***	19 °F	19 °F

* Sum of the absolute magnitude of the 10 CFR 50.46 model changes and model errors.

** The 3 °F error shown for Unit 2 Cycles 11 and 12 is a single error affecting both cycles and not two separate errors.