George Vanderheyden
Vice President
Calvert Cliffs Nuclear Power Plant
Constellation Generation Group, LLC

1650 Calvert Cliffs Parkway
Lusby, Maryland 20657
410.495.4455
410.495.3500 Fax

Constellation Energy

April 6, 2005

U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit Nos. 1 & 2; Docket Nos. 50-317 & 50-318
10 CFR 50.46 30-Day Report for Changes to the Calvert Cliffs Nuclear Power Plant Emergency Core Cooling System Performance Analysis

REFERENCES:

(a) CENPD-132, Supplement 4-P-A, "Calculative Methods for the CE Nuclear Power Large Break LOCA Evaluation Model," March 2001

(b) CENPD-137, Supplement 2-P-A, "Calculative Methods for the ABB CE Small Break LOCA Evaluation Model," April 1998

(c) Letter from Mr. B. S. Montgomery (CCNPP) to Document Control Desk (NRC), dated July 15, 2004, "License Amendment Request: Incorporate Methodology References for the Implementation of PHOENIX-P, ANC, PARAGON, and Zirconium Diboride into the Technical Specifications"

(d) WCAP-16072-P-A, Rev. 0, "Implementation of Zirconium Diboride Burnable Absorber Coatings in CE Nuclear Power Fuel Assembly Designs," August 2004.

(e) Letter from Mr. R. V. Guzman (NRC) to Mr. G. Vanderheyden (CCNPP), dated February 24, 2005, "Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 – Amendment Re: Incorporating Core Operating Limits Analytical Methodology References into Technical Specifications (TAC Nos. MC4019 and MC4020)"

This letter is submitted pursuant to 10 CFR 50.46(a)(3)(ii) to provide notification of a significant change to the peak cladding temperature of the large break loss-of-coolant accident (LBLOCA) and small break loss-of-coolant accident (SBLOCA) analyses for Calvert Cliffs Nuclear Power Plant (CCNPP).

The analyses for the LBLOCA and SBLOCA Emergency Core Cooling System performance have been re-analyzed for the upcoming Unit 2 cycle (Cycle 16). The re-analyses were performed using the latest Nuclear Regulatory Commission (NRC)-accepted versions of the Westinghouse evaluation models for Combustion Engineering designed pressurized water reactors (References a and b). The new analyses explicitly model the new fuel rod design being introduced in Cycle 16. The new fuel rod design

A001

implements ZIRLO™ clad Zirconium Diboride Integral Fuel Burnable Absorber (ZrB_2 IFBA) and UO_2 fuel rods with axial blankets and annular pellets into previously analyzed and implemented mixing vane grids.

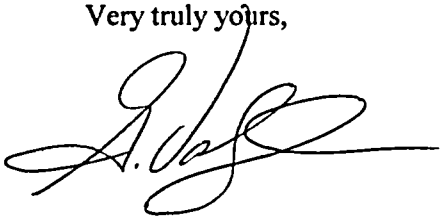
Calvert Cliffs Nuclear Power Plant requested an amendment to the CCNPP Unit 1 and Unit 2 operating license (Reference c) to add the methodology reference for the implementation of ZrB_2 IFBA coatings in CE Nuclear Power fuel assembly designs (Reference d) to the list of approved core operating limits analytical methods in the Technical Specifications. The NRC approved this request on February 24, 2005 (Reference e).

The results of the new analyses and their compliance with 10 CFR 50.46 are summarized in Attachment (1). As described in the attachment, the new LBLOCA and SBLOCA analyses constitute new licensing basis analyses (analyses-of-record) for Unit 2. A description of the analyses will be incorporated into a future revision of the CCNPP Updated Final Safety Analysis Report.

The results of the new LBLOCA and SBLOCA analyses conform to the Emergency Core Cooling System acceptance criteria of 10 CFR 50.46(b). Because the sum of the absolute magnitudes of the effects on peak cladding temperature due to the changes is greater than 50°F, the changes qualify as being significant as defined in 10 CFR 50.46(a)(3)(i). Consequently, the changes are being reported in this 30-day report. The new analyses are the licensing basis analyses for Unit 2 upon startup of Cycle 16, which started on March 16, 2005. The new analyses will become the licensing basis analyses for Unit 1 upon startup of Cycle 18, which is currently scheduled for April 2006.

Should you have questions regarding this matter, we will be pleased to discuss them with you.

Very truly yours,



GV/DJM/bjd

Attachment: (1) 10 CFR 50.46 30-Day Report for Changes to the Calvert Cliffs Nuclear Power Plant Emergency Core Cooling System Performance Analysis

cc: R. V. Guzman, NRC
S. J. Collins, NRC
Resident Inspector, NRC
R. I. McLean, DNR

ATTACHMENT (1)

10 CFR 50.46 30-DAY REPORT FOR CHANGES TO THE CALVERT CLIFFS NUCLEAR POWER PLANT EMERGENCY CORE COOLING SYSTEM PERFORMANCE ANALYSIS

Calvert Cliffs Nuclear Power Plant, Inc.
April 6, 2005

ATTACHMENT (1)

10 CFR 50.46 30-DAY REPORT FOR CHANGES TO
THE CALVERT CLIFFS NUCLEAR POWER PLANT
EMERGENCY CORE COOLING SYSTEM PERFORMANCE ANALYSIS

INTRODUCTION

This 30-day report is provided for the Calvert Cliffs Nuclear Power Plant (CCNPP) in accordance with the requirements of 10 CFR 50.46(a)(3)(ii) for reporting (1) changes in an acceptable evaluation model or the application of such a model, and (2) the estimated effect of the changes on the limiting Emergency Core Cooling System (ECCS) analysis. Because the effect on the peak cladding temperature (PCT) of the changes described herein is greater than 50°F, the changes qualify as significant as defined in 10 CFR 50.46(a)(3)(i) and, consequently, are provided in this 30-day report. No errors are reported in this 30-day report.

Emergency Core Cooling System performance for both the large break loss-of-coolant accident (LBLOCA) and the small break loss-of-coolant accident (SBLOCA) has been re-analyzed for CCNPP Unit 2. The analyses were performed with the latest Nuclear Regulatory Commission (NRC)-accepted versions of the Westinghouse Appendix K evaluation models for Combustion Engineering designed pressurized water reactors (PWRs). The analyses explicitly modeled the new fuel rod design that is being introduced in Cycle 16. The new fuel rod design implements ZIRLO™ clad Zirconium Diboride Integral Fuel Burnable Absorber (ZrB_2 IFBA) and UO_2 fuel rods with axial blankets and annular pellets into previously analyzed and implemented mixing vane grids.

The new LBLOCA and SBLOCA analyses are not assessments (i.e., they do not provide an estimate of the effect of the changes on the limiting ECCS analysis). Rather, they are complete re-analyses that use acceptable evaluation models that are applicable to CCNPP Unit 2. A summary description of the new analyses and their compliance with 10 CFR 50.46 is provided below.

LBLOCA ECCS PERFORMANCE ANALYSIS

LBLOCA Evaluation Model

The new LBLOCA ECCS performance analysis was performed with the 1999 Evaluation Model (EM) version of the Westinghouse LBLOCA evaluation model for Combustion Engineering designed PWRs (Reference 1). Additionally, the analysis used the ZIRLO™ cladding models described in Reference 2 and the models and processes for analyzing ZrB_2 IFBA fuel rods described in Reference 3. The 1999 EM, the ZIRLO™ cladding, and the ZrB_2 IFBA topical reports were generically accepted by the NRC in References 4, 5, and 6 for licensing applications for Combustion Engineering designed PWRs.

The 1999 EM, the ZIRLO™ cladding, and the ZrB_2 IFBA topical reports are listed in Technical Specification 5.6.5.b of the CCNPP Technical Specifications as approved analytical methodologies that can be used to determine core operating limits in the Core Operating Limits Report. The license amendment requests to add these methodologies to the Technical Specifications, were submitted to the NRC in References 7 and 8 and were accepted by the NRC in References 9 and 10.

The analysis complies with the limitations/constraints imposed by the Safety Evaluation Reports (SERs) for the 1999 EM, the ZIRLO™ cladding, and the ZrB_2 IFBA topical reports as well as the applicable limitations/constraints imposed by the SERs for earlier versions of the LBLOCA evaluation model.

Fuel Design Changes

The Batch V fuel assemblies introduced in Unit 2 Cycle 16 use mixing vane grids (Turbo fuel assembly), ZIRLO™ cladding, ZrB_2 IFBA coated UO_2 fuel pellets, and fuel rods with low enriched axial blankets and annular pellets. The new LBLOCA analysis explicitly analyzed the various fuel designs present in

Unit 2 Cycle 16 in order to ensure that limiting fuel rod conditions were selected for the break spectrum analysis. The hot rod heatup portion of the break spectrum analysis, which is performed with the STRIKIN-II computer code, analyzed a ZIRLO™ clad UO_2 rod in a Turbo fuel assembly. It used reflood heat transfer coefficients that were conservatively biased in order to bound the results of the more limiting fuel types present in Unit 2 Cycle 16, which will not be present in future cycles, and to bound the impact on PCT due to the mixed core effect of co-resident Turbo and non-Turbo fuel assemblies in Unit 2 Cycle 16.

Other Plant Parameter Changes

In addition to the changes described above, the new LBLOCA analysis introduced several other changes to plant parameters used in the analysis. There was an increase in the Peak Linear Heat Generation Rate from 14.3 kW/ft to 14.5 kW/ft. Also, the Unit 2 Cycle 16 plant parameters included a 33 ft^3/tank reduction in the safety injection tank (SIT) minimum water volume and a 20 psig reduction in the minimum SIT pressure. Each of these changes lead to more limiting ECCS performance analysis results to bound as-operated performance.

The new LBLOCA analysis also incorporated new bounding values for several physics parameters in order to bound larger cycle-to-cycle variations in the values of the parameters.

Results and Conclusion of the New LBLOCA Analysis

Table 1 compares important inputs used in the current and the new LBLOCA analyses. Table 2 compares important results from the two analyses. A more detailed description of the new analysis, including tables and figures that present the results of the break spectrum analysis, will be incorporated into a future revision of the CCNPP Updated Final Safety Analysis Report.

ATTACHMENT (1)

10 CFR 50.46 30-DAY REPORT FOR CHANGES TO
THE CALVERT CLIFFS NUCLEAR POWER PLANT
EMERGENCY CORE COOLING SYSTEM PERFORMANCE ANALYSIS

Table 1

Comparison of Important Parameters Used in the Current and New CCNPP Unit 2 LBLOCA ECCS Performance Analysis

Parameter	Current Analysis	New Analysis
LBLOCA Evaluation Model	1999 EM	1999 EM
Core Power Level, MWt (including power measurement uncertainty)	2754	2754
Peak Linear Heat Generation Rate, kW/ft	14.3	14.5
Hot Rod Pin-to-Box Factor	1.025	1.025
RCS Flow Rate, gpm	370,000	370,000
RCS Pressure, psia	2250	2250
Cold Leg Temperature, °F	546	546
Hot Leg Temperature, °F	597	597
Steam Generator Tube Plugging, plugged tubes/SG	847	847
Fuel Pin Integral Burnable Absorber Design	Erbia burnable absorber	ZrB_2 coating with axial blankets
Fuel Bundle Design	Turbo mixing vanes	Turbo mixing vanes
Fuel Cladding	ZIRLO™	ZIRLO™

Table 2

Comparison of Important Results of the Current and New CCNPP Unit 2 LBLOCA ECCS Performance Analysis

Parameter	Current Analysis	New Analysis
Limiting Break Size	0.6 DEG/PD[a]	0.6 DEG/PD
Peak Cladding Temperature, °F	2026	2057
Time of Peak Cladding Temperature, seconds	269	252
Maximum Cladding Oxidation, %	8.58	9.95
Maximum Core-Wide Cladding Oxidation, %	<0.99	<0.99
Time of Cladding Rupture, sec	26.1	27.5

[a] DEG/PD = Double-Ended Guillotine Break in Pump Discharge Leg

As summarized below, the results of the new LBLOCA analysis conform to the acceptance criteria of 10 CFR 50.46(b).

Parameter	Criterion	Result
Peak Cladding Temperature	≤2200°F	2057°F
Maximum Cladding Oxidation	≤17 %	9.95 %
Maximum Core-Wide Oxidation	≤1 %	<0.99 %
Coolable Geometry	Yes	Yes

The new LBLOCA analysis uses the 1999 EM, which is accepted by the NRC for licensing applications for Combustion Engineering designed PWRs such as CCNPP. The analysis complies with the limitations/constraints imposed by all applicable SERs. The analysis uses values for plant design data that are either applicable to or bound the configuration of Unit 2 Cycle 16. Calvert Cliffs Nuclear Power Plant, Inc. and Westinghouse have ongoing processes that ensure that the as-operated plant values for PCT-sensitive parameters remain bounded by the values used in the analysis.

SBLOCA ECCS PERFORMANCE ANALYSIS

SBLOCA EM

The new SBLOCA ECCS performance analysis was performed with the S2M (Supplement 2 to CENPD-137 Evaluation Model) version of the Westinghouse SBLOCA evaluation model for Combustion Engineering designed PWRs (Reference 11). Additionally, the analysis used the ZIRLO™ cladding models described in Reference 2 and the models and processes for analyzing ZrB_2 IFBA fuel rods described in Reference 3. The S2M, the ZIRLO™ cladding, and the ZrB_2 IFBA topical reports were generically accepted by the NRC in References 5, 6, and 12 for licensing applications for Combustion Engineering designed PWRs.

The S2M, the ZIRLO™ cladding, and the ZrB_2 IFBA topical reports are listed in Technical Specification 5.6.5.b of the CCNPP Technical Specifications as approved analytical methodologies that can be used to determine core operating limits in the Core Operating Limits Report. The license amendment requests to add these methodologies to the Technical Specifications were submitted to the NRC in References 7 and 8 and were accepted by the NRC in References 9 and 10.

The analysis complies with the limitations/constraints imposed by the SERs for the S2M, the ZIRLO™ cladding, and the ZrB_2 IFBA topical reports as well as the applicable limitations/constraints imposed by the SERs for earlier versions of the SBLOCA EM.

Fuel Design Changes

The new SBLOCA analysis used limiting initial fuel rod conditions that bound the various fuel and cladding types present in Cycle 16, including ZIRLO™ clad ZrB_2 IFBA coated UO_2 fuel pellets, and fuel rods with low enriched axial blankets and annular pellets.

Other Plant Parameter Changes

In addition to the changes described above, the new SBLOCA analysis introduced several other changes to plant parameters used in the analysis. The changes include the following:

- Change in the Peak Linear Heat Generation Rate to 15.0 kW/ft
- 33 ft^3/tank reduction in the SIT minimum water volume and a 20 psig reduction in the minimum SIT pressure

Results and Conclusion of the New SBLOCA Analysis

Tables 3 and 4 compare important inputs and results from the new SBLOCA analysis to those of the current SBLOCA analysis. A more detailed description of the new analysis, including tables and figures

that present the results of the break spectrum analysis, will be incorporated into a future revision of the CCNPP Updated Final Safety Analysis Report.

Table 3

Comparison of Important Parameters Used in the Current and New CCNPP Unit 2 SBLOCA ECCS Performance Analysis

Parameter	Current Analysis	New Analysis
SBLOCA Evaluation Model	S2M	S2M
Core Power Level, MWt (including power measurement uncertainty)	2754	2754
Peak Linear Heat Generation Rate, kW/ft	14.3	15.0
RCS Flow Rate, gpm	370,000	370,000
RCS Pressure, psia	2250	2250
Cold Leg Temperature, °F	550	550
Hot Leg Temperature, °F	601	601
Steam Generator Tube Plugging, plugged tubes/SG	847	847
Fuel Pin Integral Burnable Absorber Design	Erbia burnable absorber	ZrB_2 coating with axial blankets
Fuel Bundle Design	Turbo mixing vanes	Turbo mixing vanes
Fuel Cladding	ZIRLO™	ZIRLO™

Table 4

Comparison of Important Results of the Current and New CCNPP Unit 2 SBLOCA ECCS Performance Analysis

Parameter	Current Analysis	New Analysis
Limiting Break Size[a]	0.08 ft^2/PD[b]	0.08 ft^2/PD
Peak Cladding Temperature, °F	1955	1815
Time of Peak Cladding Temperature, seconds	1293	1311
Maximum Cladding Oxidation, %	9.03[c]	5.70
Maximum Core-Wide Cladding Oxidation, %	<0.81	<0.60
Time of Cladding Rupture, sec	1125	1309

(a) Break that resulted in the highest peak cladding temperature.
(b) PD = Pump Discharge Leg
(c) The 0.06 ft^2/PD break produced the maximum cladding oxidation.

As summarized below, the results of the new SBLOCA analysis conform to the acceptance criteria of 10 CFR 50.46(b).

Parameter	Criterion	Result
Peak Cladding Temperature	≤2200°F	1815°F
Maximum Cladding Oxidation	≤17 %	5.70 %
Maximum Core-Wide Oxidation	≤1 %	<0.60 %
Coolable Geometry	Yes	Yes

The new SBLOCA analysis uses the S2M, which is accepted by the NRC for licensing applications for Combustion Engineering designed PWRs such as CCNPP. The analysis complies with the limitations/constraints imposed by all applicable SERs. The analysis uses values for plant design data that are either applicable to or bound the configuration of Unit 2 Cycle 16. Calvert Cliffs Nuclear Power Plant, Inc. and Westinghouse have ongoing processes that ensure that the as-operated plant values for PCT-sensitive parameters remain bounded by the values used in the analysis.

Applicability of the New Analyses to Unit 1

The new LBLOCA and SBLOCA analyses were performed to be applicable to both Unit 1 and Unit 2 after the installation of the new fuel rod design. The new fuel rod design is scheduled to be installed in Unit 1 during the 2006 refueling outage prior to startup of Cycle 18. As part of the Unit 1 Cycle 18 reload analysis activities, CCNPP and Westinghouse will confirm the applicability of the new analyses to Unit 1 Cycle 18, by ensuring that the Cycle 18 values for PCT-sensitive parameters are bounded by the values used in the new analyses. When it is confirmed that the new analyses are applicable to Unit 1, CCNPP will incorporate the change into the Updated Final Safety Analysis Report. A separate 30-day report to the NRC detailing these same changes to the Unit 1 ECCS performance analysis will not be submitted unless there are changes to the Unit 1 analysis that cause it to differ from the analysis methods and results described in this letter.

Summary

The new LBLOCA and SBLOCA analyses comply with 10 CFR 50.46 as follows:

- The analyses were performed with acceptable evaluation models and included sensitivity studies that assured the limiting LBLOCA and SBLOCA were analyzed [10 CFR 50.46(a)(1)(i)].
- The results of the new LBLOCA and SBLOCA analyses conform to the ECCS acceptance criteria [10 CFR 50.46(b)].
- This 30-day report provides NRC with notification of the change in the application of the evaluation models and their effect on the limiting ECCS analyses [10 CFR 50.46(a)(3)(ii)].

The new LBLOCA and SBLOCA analyses constitute new licensing basis analyses (analyses-of-record). They will be used as the reference analyses to evaluate the impact on PCT of future changes to or errors in the 1999 EM and the S2M, and their application to CCNPP.

REFERENCES

1. CENPD-132, Supplement 4-P-A, "Calculative Methods for the CE Nuclear Power Large Break LOCA Evaluation Model," March 2001

2. CENPD-404-P-A, Revision 0, "Implementation of ZIRLO™ Cladding Material in CE Nuclear Power Fuel Assembly Designs," November 2001

3. WCAP-16072-P-A, Rev. 0, "Implementation of Zirconium Diboride Burnable Absorber Coatings in CE Nuclear Power Fuel Assembly Designs," August 2004

4. Letter from Mr. S. A. Richards (NRC) to Mr. P. W. Richardson (Westinghouse), dated December 15, 2000, "Safety Evaluation of Topical Report CENPD-132, Supplement 4, Revision 1, 'Calculative Methods for the CE Nuclear Power Large Break LOCA Evaluation Model' (TAC No. MA5660)"

5. Letter from Mr. S. A. Richards (NRC) to Mr. P. W. Richardson (Westinghouse), dated September 12, 2001, "Safety Evaluation of Topical Report CENPD-404-P, Revision 0, 'Implementation of ZIRLO Material Cladding in CE Nuclear Power Fuel Assembly Designs' (TAC No. MB1035)"

6. Letter from Mr. H. N. Berkow (NRC) to Mr. J. A. Gresham (Westinghouse), dated May 6, 2004, "Final Safety Evaluation for Topical Report WCAP-16072-P, Revision 00, 'Implementation of Zirconium Diboride Burnable Absorber Coatings in CE Nuclear Power Fuel Assembly Designs,' (TAC No. MB8721)"

7. Letter from Mr. C. H. Cruse (CCNPP) to Document Control Desk (NRC), dated July 27, 2001, "License Amendment Request: Incorporate Methodology References for the Implementation of ZIRLO Clad Fuel Rods into the Technical Specifications"

8. Letter from Mr. B. S. Montgomery (CCNPP) to Document Control Desk (NRC), dated July 15, 2004, "License Amendment Request: Incorporate Methodology References for the Implementation of PHOENIX-P, ANC, PARAGON, and Zirconium Diboride into the Technical Specifications"

9. Letter from Ms. D. Skay (NRC) to Mr. C. H. Cruse (CCNPP), dated April 8, 2002, "Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 Amendment Re: Implementation of ZIRLO Clad Fuel Rods (TAC Nos. MB2540 and MB2541)"

10. Letter from Mr. R. V. Guzman (NRC) to Mr. G. Vanderheyden (CCNPP), dated February 24, 2005, "Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 – Amendment Re: Incorporating Core Operating Limits Analytical Methodology References into Technical Specifications (TAC Nos. MC4019 and MC4020)"

11. CENPD-137, Supplement 2-P-A, "Calculative Methods for the ABB CE Small Break LOCA Evaluation Model," April 1998

12. Letter from Mr. T. H. Essig (NRC) to Mr. I. C. Rickard (ABB Combustion Engineering), dated December 16, 1997, "Acceptance for Referencing of the Topical Report CENPD-137(P), Supplement 2, 'Calculative Methods for the C-E Small Break LOCA Evaluation Model' (TAC No. M95687)"