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April 15, 2004

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

Dear Sirs:

**Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2, and 3
Docket Nos. STN 50-528/529/530
Emergency Core Cooling System (ECCS) Performance
Evaluation Models, 10 CFR 50.46(a)(3)(ii) Annual Report**

Pursuant to 10 CFR 50.46(a)(3)(ii), Arizona Public Service Company (APS) has enclosed the Westinghouse Electric Company's, "Annual Report on Combustion Engineering ECCS Performance Evaluation Models for PWRs, CENPD-279, Supplement 15, March 2004." This report describes the changes and errors in Combustion Engineering models for Pressurized Water Reactors (PWRs) ECCS performance analysis in calendar year 2003. Appendix A of this report is specific to PVNGS. All other appendices of this report are plant-specific to other Combustion Engineering (CE) designed facilities and have not been included as part of this submittal.

As shown in the table on page 3, the PVNGS large break loss of coolant accident (LBLOCA) and small break loss of coolant accident (SBLOCA) analyses used the 1999 EM and S2M evaluation models, respectively, throughout calendar year (CY) 2003. As of December 31, 2003, there were no known changes or errors that affected the PVNGS PCT calculations performed with these evaluation models. Additionally, because PCT is not calculated as part of the post loss of coolant accident (LOCA) long-term cooling (LTC) analysis, there are no changes or errors in the LTC models that affect PCT.

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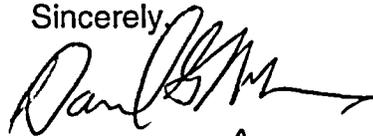
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Emergency Core Cooling System (ECCS)
Performance Evaluation Models,
10 CFR 50.46(a)(3)(ii) Annual Report
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No commitments are being made to the NRC by this letter.

If you have any questions, please contact Thomas N. Weber at (623) 393-5764.

Sincerely,



D. Marks for SAB

SAB/TNW/RKR/kg

Enclosure

cc:	B. S. Mallett	NRC Region IV Regional Administrator
	M. B. Fields	NRC NRR Project Manager
	N. L. Salgado	NRC Senior Resident Inspector for PVNGS

**Summary of Cumulative Effects on Calculated Peak Clad Temperature (PCT) for PVNGS
 Due to Changes/Errors in LOCA Evaluation Models**

PVNGS Unit	Operating Cycle	Time Period in 2003	Large Break LOCA			Small Break LOCA		
			Evaluation Model	Calculated PCT	Cumulative Effect of Changes/Errors on PCT ⁽¹⁾	Evaluation Model	Calculated PCT	Cumulative Effect of Changes/Errors on PCT ⁽¹⁾
1	11	January - December	1999 EM	2110°F	None ⁽²⁾	S2M	1618°F	None ⁽³⁾
2	11	January - September	1999 EM	2110°F	None ⁽²⁾	S2M	1618°F	None ⁽³⁾
2	12	October - December	1999 EM	2110°F	None ⁽²⁾	S2M	1618°F	None ⁽³⁾
3	10	January - March	1999 EM	2110°F	None ⁽²⁾	S2M	1618°F	None ⁽³⁾
3	11	April - December	1999 EM	2110°F	None ⁽²⁾	S2M	1618°F	None ⁽³⁾

Notes:

- (1) Pursuant to 10 CFR 50.46(a)(3)(i), this is a cumulation of the absolute magnitudes of the respective changes in Peak Clad Temperature (PCT) for each known change and/or error in the associated LOCA evaluation model.
- (2) Supplement 14 of CENPD-279, states that STRIKIN-II computer code errors were identified and corrected in CY 2002, involving a time step algorithm and the Coffman plastic strain model. The PVNGS 1999 EM LBLOCA analyses, however, utilized a corrected version of STRIKIN-II. Therefore, these errors have no effect on calculated PCT for PVNGS. There is no previous accumulated effect on PCT for the 1999 EM LBLOCA analyses, nor are there any changes or errors identified in CY 2003.
- (3) Supplement 13 of CENPD-279 states that a CEFLASH-4AS computer code error was identified and corrected in CY 2001, involving calculations of leak flow rate with out-of-range subscripts. The PVNGS S2M SBLOCA analyses, however, utilized a corrected version of CEFLASH-4AS. Therefore, this previously reported error had no effect on calculated PCT for PVNGS. There is no previous cumulative effect on PCT for the PVNGS S2M SBLOCA analyses, nor are there any changes or errors identified in CY 2003.

ENCLOSURE

**Annual Report on Combustion Engineering ECCS
Performance Evaluation Models for PWRs, CENPD-279,
Supplement 15, dated March 2004**

Westinghouse Non-Proprietary Class 3

CENPD-279, Supplement 15

March 2004

Annual Report on
Combustion Engineering ECCS
Performance Evaluation Models
for PWRs



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ABSTRACT

This report describes changes and errors in the ECCS performance evaluation models (EM) for PWRs developed by Combustion Engineering in calendar year (CY) 2003 per the requirements of 10CFR50.46. For this reporting period, there were no changes or errors in the evaluation models or application of the models that affect the cladding temperature calculation.

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.

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APPENDICES (Plant Specific Considerations)

- A. ARIZONA PUBLIC SERVICE COMPANY (PVNGS Units 1-3)
- B. CALVERT CLIFFS NUCLEAR POWER PLANT INCORPORATED
(Calvert Cliffs Units 1 & 2)
- C. SOUTHERN CALIFORNIA EDISON COMPANY (SONGS Units 2 & 3)
- D. DOMINION RESOURCES (Millstone Unit 2)
- E. ENTERGY OPERATIONS, INCORPORATED
 - 1. Arkansas Nuclear One Unit 2
 - 2. Waterford Unit 3
- F. FLORIDA POWER AND LIGHT COMPANY (St. Lucie Unit 2)
- G. CONSUMERS ENERGY COMPANY (Palisades)

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

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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 2-16.

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 use 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.

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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.

There were no changes to or errors in the ECCS evaluation models for PWRs or changes to their operation for calendar year (CY) 2003 that affect the calculated cladding temperature.

4.0 CONCLUSIONS

There were no changes to or errors in the ECCS evaluation models for PWRs or their application for LBLOCA, SBLOCA, or post-LOCA long term cooling that affect the calculated cladding temperature during CY 2003.

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 2-16, remains less than 1°F. The maximum impact on PCT calculated with the 1999 EM is less than 1.2°F. Plant specific LBLOCA considerations for each plant are discussed in Appendices A through G.

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 generic accumulated change in cladding temperature for the S2M. The overall plant specific PCT effects for SBLOCA are summarized in Appendices A through G.

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, February, 1997.
11. "Annual Report on ABB CE ECCS Performance Evaluation Models," CENPD-279, Supplement 9, March, 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. "Annual Report on Combustion Engineering ECCS Performance Evaluation Models for PWRs," CENPD-279, Supplement 14, Rev. 1, April, 2003.

APPENDIX A

ARIZONA PUBLIC SERVICE COMPANY

Plant Specific Considerations for Palo Verde Units 1, 2 and 3

There is no effect on LBLOCA analyses for ZIRLO™ cladding and revised heat sinks done with the 1999 EM because the corrected version of STRIKIN-II was used.

There is no plant specific effect for the bounding S2M SBLOCA analysis of Palo Verde Units 1, 2 and 3 and the RSG/Power Uprate because they report results found with a corrected version of CEFLASH-4AS.