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December 13, 2001

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Station P1-37
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 "Annual Report on Combustion Engineering ECCS Performance Evaluation Models for PWRs, CENPD-279, Supplement 12, April 2001." This report describes the changes and errors in Combustion Engineering models for Pressurized Water Reactors (PWRs) ECCS performance analysis in calendar year 2000. 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.

For this reporting period, calendar year 2000, there were no changes or errors in the evaluation models or application of the models that affect the cladding temperature calculation.

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,

SAB/TNW/JAP/kg

Enclosure

cc: E. W. Merschoff
L. R. Wharton
J. H. Moorman

A001

ENCLOSURE

**Annual Report on Combustion Engineering ECCS
Performance Evaluation Models, CENPD-279, Supplement 12,
dated April 2001**

CENPD-279
Supplement 12

ANNUAL REPORT ON
COMBUSTION ENGINEERING ECCS
PERFORMANCE EVALUATION MODELS
for PWRs

April 2001

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ABSTRACT

This report describes changes and errors in the Combustion Engineering ECCS performance analysis models for PWRs in calendar year 2000 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 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 total effect relative to the 50°F definition of a significant change in PCT is the sum of <1°F and plant specific effects, if any, described in Appendices A-G. The accumulated change in cladding temperature for the large break LOCA 1999 EM is 0°F. The sum of the absolute magnitude of the maximum cladding temperature changes for the small break LOCA S1M evaluation model from all reports to date is less than 3°F. The accumulated change in cladding temperature for the small break LOCA S2M evaluation model is 0°F. No change occurred in the PCT due to post-LOCA long term cooling issues.

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APPENDICES (Plant Specific Considerations)

- A. ARIZONA PUBLIC SERVICE COMPANY (PVNGS Units 1-3)
- B. BALTIMORE GAS AND ELECTRIC COMPANY (Calvert Cliffs Units 1 & 2)
- C. SOUTHERN CALIFORNIA EDISON COMPANY (SONGS Units 2 & 3)
- D. CONSUMERS ENERGY (Palisades)
- 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. NORTHEAST UTILITIES (Millstone Unit 2)

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 Combustion Engineering ECCS performance evaluation models for PWRs, 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 2-13.

2.0 COMBUSTION ENGINEERING ECCS EVALUATION MODELS AND CODES

Five Combustion Engineering Evaluation Models (EM) for ECCS performance analysis of PWRs 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 accepted by the NRC in 2000. There are two evaluation models for Small Break LOCA (SBLOCA): the original SBLOCA Evaluation Model (S1M) and the S2M SBLOCA EM accepted by the NRC in 1997. Post-LOCA Long Term Cooling (LTC) analyses are performed with the LTC evaluation model.

Several Combustion Engineering 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 analysis 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 Combustion Engineering ECCS performance evaluation models for PWRs which may affect the calculated PCT.

There were no changes to or errors in the ECCS evaluation models for PWRs or changes to their application for calendar year 2000 that affect the calculated cladding temperature.

4.0 CONCLUSIONS

There were no changes to or errors in the Combustion Engineering ECCS evaluation models for PWRs or their application for LBLOCA, SBLOCA, or post-LOCA long term cooling that affect the calculated cladding temperature during 2000. 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 2-13, remains less than 1°F relative to the 50°F criterion for a significant change in PCT. The total LBLOCA PCT impact for a given plant is <1°F plus the plant specific effects, if any, described in Appendices A through G. There is no accumulated PCT error for the 1999 EM for LBLOCA.

The sum of the absolute magnitude of the changes in maximum cladding temperature for the SBLOCA S1M evaluation model (due to the change in application of the SBLOCA S1M evaluation model described in Reference 11) is less than 3°F. The accumulated change in cladding temperature for the S2M evaluation model is 0°F. Plant specific SBLOCA considerations for each plant, if any, are discussed in Appendices A through G.

The sum of the absolute magnitude of the changes in cladding temperature for the post-LOCA long term cooling evaluation model is zero.

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.

APPENDIX A

ARIZONA PUBLIC SERVICE COMPANY

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

There are no outstanding plant specific considerations for Palo Verde Units 1, 2 and 3.

ATTACHMENT 2

Errors in Codes Used for PWR ECCS Performance Analysis

The code error described here was identified in calendar year 2000 per the provisions of the computer software section, QP 3.13, of the CENP Quality Procedures Manual, Reference 1. It has no impact on the Peak Cladding Temperature (PCT); therefore, it is not reportable under the provisions of 10CFR50.46. This information is provided for completeness in the error reporting process.

CEFLASH-4A Error

CEFLASH-4A performs LBLOCA blowdown hydraulics calculations for the CENP PWR ECCS EM.

CEFLASH-4A models for variable flow area as a function of pressure (Path Type 9) and variable flow area as a function of time (Path Type 10) were found to not open after the transient starts. However, a Type 9 or 10 path open during initialization does pass flow correctly until the transient starts. A Type 10 path is used at time zero for a double ended guillotine break and closes correctly after the transient starts. Type 9 paths may be used to represent the MSSVs but are not intended to open. Otherwise Type 9 and 10 paths are not used in ECCS analyses done with the approved Evaluation Model. Consequently, the error has no effect on licensing analysis results for LBLOCA ECCS Performance. The error is corrected in the next version of the code.

References

1. "CE Nuclear Power LLC Quality Procedures Manual," QPM-101, Revision 05, July 1, 2000.