

CENPD-279
SUPPLEMENT 7

ANNUAL REPORT ON ABB CE ECCS
PERFORMANCE EVALUATION MODELS

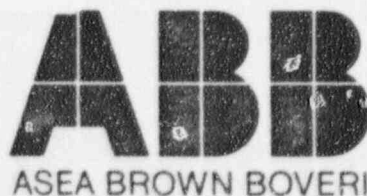
FINAL REPORT

February 1996

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ABB Combustion Engineering Nuclear Operations

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ABSTRACT

This report describes changes and errors in the ABB Combustion Engineering evaluation models for ECCS analysis in 1995 per the requirements of 10CFR50.46. For this reporting period, one error in the input processing for the COMPERC-II refill/reflood code for large break LOCA analysis was found and corrected. No other changes were made to the ABB CE evaluation models for the large break, small break or post-LOCA long term cooling calculations.

Correction of the error in COMPERC-II had no effect on the cladding temperature (PCT) for large break LOCA. The sum of the absolute magnitudes of the PCT changes for large break LOCA from all reports to date continues to be less than 1 °F. No change occurred in the PCT for small break LOCA or post-LOCA long term cooling. Per the criteria of 10CFR50.46, no action beyond this annual report is required.

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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, spells 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 ABB CE ECCS performance evaluation models, 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. ABB CE reports for earlier years are given in References 2-8.

2.0 ABB CE CODES USED FOR ECCS EVALUATION

ABB CE uses several digital computer codes for ECCS performance analysis that are described in topical reports, are licensed by the NRC, and are covered by the provisions of 10CFR50.46.

Those for large break LOCA 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 small break LOCA calculations. The codes for post-LOCA long term cooling 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 ABB CE ECCS performance evaluation models which may affect the calculated PCT. In 1995 an error in the input processing for one computer code used in the large break LOCA evaluation model was corrected. The nature of this error and the steps taken to resolve it are described below.

3.1 COMPERC-II for Large Break LOCA

3.1.1 Code Description

COMPERC-II calculates the reactor cooling system (RCS) hydraulic response during the refill/reflood portion of a large break LOCA transient. Models are provided in the code for the hydraulic behavior of the NSSS, addition and removal of fluid, core heat transfer, containment pressure, related systems, and properties. It also calculates the reflood heat transfer coefficient for the cladding using a FLECHT-based correlation.

3.1.2 Error in COMPERC-II

The error identified is in the input processing for the containment pressure module of the code. The code documentation, Reference 9, describes the maximum number of entries permitted for each input array that is used in the containment pressure module. However, the code does not check to ensure that the number of entries specified for each input array does not exceed the maximum number allowed.

An error can occur if the number of entries specified exceeds the maximum number supported. For the FORTRAN language, use of more entries in an array than the number of entries defined by the DIMENSION statement for the array overwrites the information in subsequent memory locations. This has the possibility of causing erroneous results depending on the specific array involved.

3.1.3 Correction of COMPERC-II Code Error

The error was addressed by revising the administrative procedures controlling use of the COMPERC-II code.

3.1.4 Impact of COMPERC-II Error on PCT

No ECCS performance analyses using the ABB CE large break LOCA evaluation model are impacted by this error. Consequently, there is no impact on the calculated PCT.

4.0 CONCLUSIONS

One error was found and corrected in the COMPERC-II computer code used for large break LOCA analysis during 1995. There was no change in the PCT as a result of correcting this error. No other changes to the models and methods or corrections of errors were made in 1995. The sum of the absolute magnitudes of the changes in PCT calculated using the C-E ECCS evaluation models, including those from previous annual reports, References 2-8, remains less than 1 °F.

Based on the results reported here, there was no significant change in the sense of 10CFR50.46 in 1995 and no action beyond the submission of this report is needed.

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 C-E ECCS Codes and Methods for 10CFR50.46," CENPD-279, Supplement 6, February, 1995.
9. "COMPERC-II, A Program for Emergency-Refill-Reflood of the the Core," CENPD-134 P, August, 1974.

COMPERC-II, A Program for Emergency Refill-Reflood of the Core (Modifications)," CENPD-134 P, Supplement 1, February, 1985.