ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
UNITED STATES ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

November 20, 1974

Honorable Dixy Lee Ray
Chairman
U. S. Atomic Energy Commission
Washington, D. C. 20545

Subject: REPORT ON EVALUATION MODELS FOR COMMISSION CRITERIA FOR EMERGENCY CORE COOLING SYSTEMS FOR LIGHT-WATER-COOLED NUCLEAR POWER REACTORS

Dear Dr. Ray:

At its 175th meeting, November 14-16, 1974, the Advisory Committee on Reactor Safeguards completed a review of Evaluation Models which have been submitted in accordance with the Commission criteria set forth in 10 CFR 50.46. The following subcommittee meetings with reactor vendors were held in Washington, D. C.: March 28, 1974, Babcock and Wilcox; April 25, 1974, General Electric Company; April 26, 1974, Westinghouse Electric Corporation; and May 18, 1974, Combustion Engineering, Inc. Subcommittee meetings were held with the Regulatory Staff and their consultants in Washington, D. C., on August 6, 1974, September 28, 1974 and October 26, 1974. The Committee also had the benefit of the documents listed below. Previous reports to the Commission on interim acceptance criteria were made on January 7, 1972, and on the proposed changes on September 10, 1973. The Committee has also addressed the safety research programs and the latest report is on November 20, 1974.

The ACRS believes that the four light-water reactor vendors have developed Evaluation Models which, with the additional modifications required by the Regulatory Staff, will conform to Appendix K to Part 50.

Approved Evaluation Models will aid in conducting the licensing reviews, but a variety of specifics must be evaluated on a case-by-case basis. Items such as the particular features of a containment, sequencing of operations, single failure analysis and special features of the reactor design, are noted in the Staff's review of the vendor models. Additional items involving peaking factors and treatment of the uncertainties in the power distributions and monitoring of the power levels remain to be incorporated, case-by-case, in the Technical Specifications with appropriate conservatism.

The generic review of the vendor models proposed for Appendix K, like the reviews of the Interim Acceptance Criteria models, has contributed to improved understanding of the modeling techniques, including the applicability and limitations on current knowledge of thermal and hydraulic phenomena, and the need for more definitive safety research programs and code developments. The implementation of safety research programs, noted in the Committee's (November 20, 1974) report, and their results should have impact on the future evaluation methods and ECC systems.

The ACRS remains mindful that the Evaluation Models, in themselves are not the desired end products, but that effective, reliable emergency core cooling systems are the objective. The Committee acknowledges the contribution to reduced peak clad temperatures resulting from recent core design changes but reaffirms its position stated in the September 10, 1973 report that improved ECCS reliability and capability should continue to be sought and, to the extent practical, employed.

Sincerely yours,

W. R. Stratton

W. R. Stratton
Chairman

References Attached.

References

1) WCAP-8170 (P) dated June 1974, "Calculational Model for Core Reflooding After a Loss-of-Coolant Accident"
2) WCAP-8200 (Rev. 2 (P)) dated June 1974, "WFLASH - A Fortran - IV Computer Program for Simulation of Transients in a Multi-Loop PWR"
3) WCAP-8301 (P) dated June 1974, "LOCTA - IV Program Loss-of-Coolant Transient Analysis"
4) WCAP-8302 (P) dated June 1974, "SATAN IV Program: Comprehensive Space-Time Dependent Analysis of Loss-of-Coolant"
5) WCAP-8327 (P) dated July 1974, "Containment Pressure Analysis"
6) WCAP-8339 (NP) dated June 1974, "Westinghouse Emergency Core Cooling System Evaluation Model, Summary"
7) WCAP-8340 dated July 1974, "Westinghouse ECCS - Plant Sensitivity Studies"
8) WCAP-8341 (P) dated July 1974, "Westinghouse Emergency Core Cooling System Evaluation Model Sensitivity Studies"
9) WCAP-8354 (P) dated July 1974, "Long Term Ice Condenser Containment Code - LOTIC Code"
10) BAW-10091, "B&W's ECCS Evaluation Model Report with Specific Application to 177 FA Class Plants with Lowered Loop Arrangement," August 1974
11) BAW-10092, CRAFT2 - Fortran Program for Digital Simulation of a Multinode Reactor Plant During Loss-of-Coolant," July 1974
12) BAW-10093, "REFLOOD - Description of Model for Multinode Core Reflood Analysis," July 1974
13) BAW-10094, "Revisions to THETA 1-B, A Computer Code for Nuclear Reactor Core Thermal Analysis," IN-1445, July 1974
14) BAW-10095, "CONTEMPT - Computer Program for Predicting Containment Pressure-Temperature Response to a Loss-of-Coolant Accident," July 1974
15) CENPD-132, "Calculative Methods for the CE Large Break LOCA Evaluation Model," (P) August 1974
16) CENPD-134 (P) April 1974, "COMPERC-II, A Program for Emergency Refill-Reflood of the Core"
17) CENPD-135 (P) April 1974, "STRIKIN-II, A Cylindrical Geometry Fuel Rod Heat Transfer Program"
18) CENPD-136 (P) July 1974, "High Temperature Properties of Zircaloy and UO_2 for Use in LOCA Evaluation Models"
19) CENPD-137 (P) August 1974, "Calculative Methods for the CE Small Break LOCA Evaluation Model"
20) CENPD-138 (P) April 1974, "PARCH - A Fortran IV Digital Computer Program to Evaluate Pool-Boiling Axial Rod and Coolant Heatup"
21) CENPD-139, "CE Fuel Evaluation Model (FATES Thermal Performance and Densification Model)"
22) NEDO-20566 (DRAFT) (P) - "General Electric Analytical Model for Loss-of-Coolant Analysis in Accordance with 10 CFR 50 Appendix K"
23) Status Report By The Directorate of Licensing In The Matter Of Babcock and Wilcox ECCS Evaluation Model Conformance To 10 CFR 50, Appendix K (undated)

24) Supplement 1 To The Status Report By The Directorate Of Licensing In The Matter Of Babcock And Wilcox ECCS Evaluation Model Conformance To 10 CFR 50, Appendix K, November 13, 1974
25) Status Report By The Directorate Of Licensing In The Matter Of Combustion Engineering, Inc. ECCS Evaluation Model Conformance To 10 CFR 50, Appendix K (undated)
26) Supplement To The Status Report By The Directorate Of Licensing In The Matter Of Combustion Engineering, Inc. ECCS Evaluation Model Conformance To 10 CFR 50, Appendix K, November 13, 1974
27) Status Report By The Directorate Of Licensing In The Matter Of General Electric ECCS Evaluation Model Conformance To 10 CFR 50, Appendix K (undated)
28) Supplement 1 To The Status Report By The Directorate Of Licensing In The Matter Of General Electric ECCS Evaluation Model Conformance To 10 CFR 50, Appendix K, November 13, 1974
29) Status Report By The Directorate Of Licensing In The Matter Of Westinghouse Electric Company ECCS Evaluation Model Conformance To 10 CFR 50, Appendix K (undated)
30) Supplement To The Status Report By The Directorate Of Licensing In The Matter Of Westinghouse Electric Company ECCS Evaluation Model Conformance To 10 CFR 50, Appendix K, November 13, 1974
31) WREM: Water Reactor Evaluation Model, October 1974, Regulatory Staff-Technical Review
32) Water Reactor Evaluation Model (WREM): PWR Nodalization And Sensitivity Studies, October 1974, Regulatory Staff-Technical Review
33) Water Reactor Evaluation Model (WREM): BWR Nodalization And Sensitivity Studies, October 1974, Regulatory Staff-Technical Review
34) Evaluation Of LOCA Hydrodynamics, November 1974, Regulatory Staff-Technical Review