



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

ENCLOSURE 1

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO APPLICABILITY OF THE WCOBRA/TRAC UPI ECCS
EVALUATION MODEL TO PLANTS WITH ZIRLO-CLAD FUEL

1.0 INTRODUCTION

In a letter of May 25, 1993, Westinghouse Electric Corporation (W) submitted topical report WCAP-13677, "10 CFR 50.46 Evaluation Model Report: WCOBRA/TRAC Two-Loop Upper Plenum Injection Model Updates to Support ZIRLO Cladding Option," which describes application of the W large-break (LB) loss-of-coolant accident (LOCA) analysis methodology described in WCAP-10924-P-A to W plants featuring an upper plenum injection (UPI) emergency core cooling system (ECCS) design and having cores containing VANTAGE+ (ZIRLO-clad) fuel.

2.0 STAFF EVALUATION

2.1 Westinghouse UPI ECCS Evaluation Model

The ECCS evaluation model (EM), which W uses to demonstrate conformance with the requirements of 10 CFR 50.46 for its UPI plants, is described in WCAP-10924-P-A. The earliest staff-approved version of this model was issued in December 1988. There have been additions and changes to the EM; the most recently approved version (August 1990) was discussed in a staff safety

evaluation report (SER) of February 8, 1991. The staff is reviewing a newer version (April 1991) of the EM.

The UPI EM was written and approved in keeping with the processes prescribed in SECY-83-472, "Emergency Core Cooling System Analysis Methods," November 17, 1983. The SECY-83-472 methods have been found to be in conformance with 10 CFR Part 50 (Appendix K).

2.2 ZIRLO

ZIRLO is a zirconium alloy described in Westinghouse topical report WCAP-12610, which was approved in a staff SER of July 1, 1991. The staff approved Appendices F and G of WCAP-12610, describing the application of other EMs conforming with 10 CFR Part 50 (Appendix K) to small-and large-break LOCA analyses, in an SER of October 9, 1991, based on pertinent similarities between Zircaloy (for which those methods had already been approved) and ZIRLO.

Because the similarities between Zircaloy and ZIRLO, the staff amended, 10 CFR 50.46 (on August 31, 1992) to include ZIRLO as a fuel covered by that regulation.

2.3 Application of WCOBRA/TRAC UPI Methodology to ZIRLO

WCAP-13677 describes the adaptation of the W UPI EM, approved for application to W UPI plants with Zircaloy-clad fueled cores, for use in LBLOCA analyses for W UPI plants with cores containing ZIRLO-clad fuel. Although the UPI EM differs from the EM applied to non-W UPI plants, the adaptation is basically the same, reflecting differences in material properties between Zircaloy and ZIRLO, but retaining all features of the EM, including calculation of metal-water reaction rates based on the Baker-Just equation. Likewise, use of the EM for plants with cores containing VANTAGE+ fuel is not changed from its use in analyzing plants with cores containing only Zircaloy-clad fuel, and no mixed-core penalty needs to be applied when analyzing cores containing mixtures of ZIRLO-clad and Zircaloy-clad fuel if both types of fuel have the same design features (see the staff SER of October 9, 1991, for a discussion of those features). The remainder of the October 9, 1991, SER discussion of EM usage for the non-W UPI EM with ZIRLO also applies to the W UPI EM with ZIRLO and the staff has concluded that the difference in material properties between Zircaloy and ZIRLO may change the magnitude of the peak cladding temperature spectrum, but the identification of worst break is not expected to change.

3.0 STAFF CONCLUSIONS

On the basis of its review (as discussed in Section 2), the staff finds that application of any approved version of the W UPI EM to plants having cores containing ZIRLO fuel complies with the SECY 83-472 guidance and is

acceptable. Therefore, WCAP-13677 is acceptable. However, the staff notes that the April 1991 version of the UPI model (Reference 5 in Section 6.0 of WCAP-13677) is not approved at this time.

As discussed in WCAP-13677, usage of the model in performing analyses of plants with cores containing ZIRLO-clad fuel remains the same as for analyses of plants with cores containing only Zircaloy-clad fuel.

Because both ZIRLO and the W UPI EM are covered by the provisions of 10 CFR 50.46 and 10 CFR Part 50 (Appendix K), this usage of the EM does not require a special exemption from the requirements of 10 CFR 50.46 or 10 CFR Part 50 (Appendix K) to account for the ZIRLO, though other exemptions from certain requirements of these regulations required to account for overall UPI system design remain as for Zircaloy. Since only material property inputs to the EM are changed in ZIRLO analyses, and the basic EM and its usage remain the same, existing exemptions related to the specific UPI plant system design in applying the EM for Zircaloy cores remain effective for cores containing ZIRLO.