Westinghouse Electric Corporation Energy Systems

NTD-NRC-94-4071

Nuclear Technology Division

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February 25, 1994

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Gentlemen:

SUBJECT: FINAL REPORT OF AN EVALUATION OF A DEVIATION OR FAILURE TO COMPLY PURSUANT TO 10CFR21.21(a)(2)

Ref: ET-NRC-91-3647, dated December 20, 1991

The following information is provided to close out one Interim Report previously filed (Reference 1) pursuant to the requirements of 10CFR Part 21. The purpose of this report is to update the status of this item by describing the nature of the Part 21 evaluation which was completed in December 1992.

SMALL BREAK LOCA/LOCTA-IV BURST AND BLOCKAGE MODELS
(Interim Report PI-91-005)

For small break LOCA analyses, Westinghouse had assumed that, consistent with the large break LOCA assumptions, fuel rod initial conditions that result in the highest calculated peak clad temperature (PCT) result from beginning of life (BOL) conditions. Typically, rupture of the fuel from cladding was not calculated for BOL conditions in a small break LOCA due to the relatively low fuel rod internal pressure and small differential pressure across the cladding. Fuel rod burst during the course of a small break LOCA analysis was found to potentially result in a significant temperature excursion above the clad temperature transient for a non-burst case. A rupture of the fuel rod in a small break LOCA can result in an increase in PCT due to flow blockage effects and the effect of the metal water reaction on the inside of the cladding. Since the methodology for SBLOCA analyses had been to perform the analyses at a near beginning of life (BOL) condition, where rod internal pressures are relatively low, most analyses did not result in the occurrence of rod burst, and therefore may not have reflected the most limiting time in life PCT. However, the fuel rod internal pressure increases with burnup, and rupture of the cladding may be calculated during a small break LOCA for middle or end of life conditions.

In order to provide an interim evaluation of the effects of this phenomenon, Westinghouse developed an analytical model which allows the prediction of rod burst PCT effects based upon the existing analysis of record. The effect of small LOCA burst and blockage has been accounted for through

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assessment of a PCT penalty in the LOCA analyses to confirm that the PCT acceptance criterion has been met. For all future analysis procedures have been established to perform fuel rod burnup studies as needed to determine the limiting time in life PCT. Thus, Westinghouse concludes that PCT effects of fuel rod internal pressure increase with burnup and cladding rupture during a small break LOCA will not represent a defect creating a substantial safety hazard and, more likely than not, will not result in a failure to comply with any applicable regulation relating to a Substantial Safety Hazard. This completes our Part 21 evaluation on Interim Report 91-005.

If you have any questions regarding this matter, please contact Mr. H. A. Sepp of my staff at 412/374-5282, or myself.

Sincerely,

N. J. Liparulo, Manager
Nuclear Safety and Regulatory Activities

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