SENSITIVITY OF SBLOCA ANALYSIS TO MODEL NODALIZATION

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INTRODUCTION

Recent attention was focused (by Semiscale test S-UT-8) upon the possibility for primary liquid to be retained in the steam generators during a predicted SBLOCA, permitting core uncovering prior to loop seal clearance. If the steam generator behavior is sensitive to the choice of nodalization in the steam generator, SBLOCA analytical results will be similarly sensitive. The Division of Systems Integration of the U.S.N.R.C. has suggested that vendor codes be reviewed to determine if they adequately model liquid storage in the U-tubes, since computed consequences of a SBLOCA might be more severe when this phenomenon is included.

In the course of performing a series of audit computations on Westinghouse computer codes, ANL pursued a brief steam generator nodalization sensitivity study to determine the impact of nodalization on the degree of conservatism. We found that nodalization does indeed impact the predicted degree of liquid retention in the steam generator tubes prior to loop seal clearance, and that RELAP5 analysis using the EG&G (LOFT) standard nodalization does not give the most conservative results. Rather, this study indicates that a finer nodalization is required.

MODEL DESCRIPTION

Two models of the Westinghouse RESAR plant having different nodal configurations were developed for the study: one with 10 nodes (coarse nodalization) and the other with 18 nodes (fine nodalization) in the steam generator primary side (Fig. 1). The nodalization configura-
tions for the remainder of the system of the plant were identical for the two cases. The steam generator model was developed by ANL to represent the Westinghouse model D steam generator, while the balance of the plant model was obtained from an input deck developed by EG&G for a best estimate SBLOCA analysis for a RESAR-3S plant with model F steam generators.

TRANSIENT BEHAVIOR PREDICTED BY RELAP5

The break spectrum study encompassed equivalent break diameters from 1" to 6" for the fine nodding plant model, and 2" to 5" for coarse nodding plant model. The break was located at the bottom of pump discharge cold leg. The transients were run until the time the primary inventory began to recover.