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DENTON,H.R. Office of Nuclear Reactor Regulation, Director
REID,R.W. Operating Reactors Branch 4

SUBJECT: Summarizes small break model development plan re ability to predict modes of natural circulation for LOFT integral test, supplementing 801114 ltr & 801216 discussion. Revised model documentation will be provided by 820301.

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January 30, 1981

Mr. H. R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. R. W. Reid, Chief
Operating Reactors Branch No. 4

Re: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287

Dear Sir:

This letter supplements my letter of November 14, 1980 and provides follow-up information as discussed with the NRC Staff on December 16, 1980. This meeting was extremely beneficial in the preparation of the program necessary to address the concerns alluded to in Item II.k.3.30 of NUREG-0737. Duke continues to believe that the existing small break LOCA model, as approved by the NRC Staff, fully meets the requirements of 10CFR50, Appendix K. Duke plans to support a Babcock & Wilcox Owners Group program which will make certain modifications to the existing model and also provide further justification of certain parts of the model as summarized below:

1. Steam Generator Model

Models will be provided in the CRAFT2 code to more phenomologically account for the steam generator heat transfer due to the primary and secondary flow regimes, mixture levels and condensation in the presence of a non-condensible gas. This steam generator model, along with other models described below, will be used in a revised natural circulation model. These models will be compared against LOFT test results.

2. Pressurizer Model

A 2-region non-equilibrium pressurizer model will be put in the CRAFT2 code. The model will utilize fully-coupled conservation and state equations. The model will also provide for the pressurizer heater and spray actuation effects. The present surge line (no flooding) model will be justified. This model will be compared to Babcock & Wilcox plant transient data.

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3. Core Mixture Level and Heat Transfer Models

Previous studies will be used to justify the core mixture level calculation. The ORNL high pressure core boiloff experiments will be used to justify the present heat transfer model.

4. ECC Injection Model

The sensitivity of the NSS to non-equilibrium ECC injection will be assessed. The enthalpy of the injected ECC fluid will be adjusted that local condensation and depressurization are reduced if necessary. Compensation would then be included to provide overall conservation of energy to account for the true injection enthalpy.

5. Noding Model

A noding sensitivity study for certain components of the RCS will be used in conjunction with previous experience in selecting a noding model for the entire system. This model will be checked sufficiently to ensure convergence and will also be compared against previous analyses.

6. Break Flow Model

A search of the literature will be performed to select a "Best Estimate" leak flow model. Analyses will then be performed to compare the present model with the "Best Estimate." The objective will be to show the present model to be adequate.

7. Non-Condensible Gas Model

All sources of non-condensible gases will be accounted for including the radiolytic component. The radiolytic component will be determined with a model which accounts for the boiling in the core region.

8. Two-Phase Flow Model

A drift flux model will be included in CRAFT2 as part of the L3-6 prediction. This model will be modified as necessary to permit simultaneous use of both drift flux and bubble rise models, with a junction between vertical and horizontal piping sections.

9. Reactor Coolant Pump Model

NUREG-0623 contains a concern for the two-phase reactor coolant pump models. This concern is acknowledged here, however, this concern will be addressed as part of our response to NUREG-0737, Item II.K.3.5.

In addition to the verification referred to above for individual models, overall verification of the total model including the ability to predict various modes of natural circulation will be accomplished through LOFT integral test predictions.

The above summary represents the present small break model development plan. It is possible that, during the course of the development and verification effort, additional model improvements will become necessary. These models would be included and documented in the final revised model submittal. It is also possible that verification studies may demonstrate that some of the above analytical improvements may not produce significantly different results from a simpler representation of the system in terms of analytical models or noding network. If this occurs, a decision to utilize simpler modelling techniques may be made. In this situation, we will provide adequate information and/or sensitivity studies to justify and defend the acceptability of the final models utilized.

The revised model documentation will be provided in a report to the NRC Staff by March 1, 1982. Partial submittals may be made at earlier dates as specific work tasks become completed.

Very truly yours,

William O. Parker, Jr.

William O. Parker, Jr.

RLG:pw