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

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MEMORANDUM FOR: Thomas M. Novak, Chief, Reactor Systems Branch, DSS

FROM: Zoltan R. Rosztoczy, Chief, Analysis Branch, DSS

SUBJECT: COMMENTS AND QUESTIONS ON WESTINGHOUSE REPLIES TO STAFF'S ATWS STATUS REPORT

The attached enclosure presents comments and new questions arising from Westinghouse's new submittals. Although some of the staff's questions in the status report are answered in these submittals, our review indicates that the resolution of the steam generator heat transfer degradation model is dependent on the review of the TRANFLO code. This code has not yet been submitted for review. Hence, based on staff's audit calculations made using the RELAP3B code, the 240 psi penalty on the pressure predictions cannot be removed until the TRANFLO code (or its appropriate parts) has been reviewed and found acceptable.

The questions and comments in the enclosure should be transmitted to Westinghouse.

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Enclosure

In response to the staff's concerns in Reference 1, Westinghouse presented additional information in References 2 and 3. These references respond to some of the concerns expressed in Reference 1. However, Reference 3 introduces some new concerns because of the reduced conservatism of the computational model. The details and the background information are presented as follows.

The status report assigns a 240 psi correction to the predicted pressures by the LOFTRAN code. The status report (Reference 1) states that this correction can be removed if Westinghouse provides the following:

a.) A time step sensitivity study demonstrating numerical convergence.

b.) Detailed analysis method showing that the steam generator heat transfer coefficient from the primary side to the secondary side can be degraded proportional to the liquid mass in the secondary side during the steam generator tube uncovering.

c.) Using a multinode model, it can be shown that the heat transfer coefficient between the fuel rod and coolant can be approximated by a function dependent upon average fuel temperature only.

d.) Pressurizer model is verified by comparison with experimental data and the time constants are selected so that the predicted pressures are conservative for the transient involved.

e.) Demonstrate that neglecting the steam generator tube metal conductivity in the heat transfer calculations is conservative.

f.) The initial steam generator mass can be verified using detailed calculations.

In Reference 2, Westinghouse addressed these items. The replies to items a), c), d) and e) are acceptable. For items b) and f), reference was made to a detailed calculational model (TRANFLO code) but no information on this model has been presented. Hence, the final acceptance will be based on the review of the information to be received on the TRANFLO code. The correction of 240 psi cannot be removed at this time since the staff audit calculations made using the RELAP3B code indicated that Item b) is the major reason for the differences between the calculational results presented in WCAP-8330 and the staff's audit calculations presented in Reference 1.

In Reference 3, Westinghouse made new assumptions and used new modeling techniques to make calculations using a moderator coefficient valid 99% of the time. The safety valve water relief model used for this purpose may be non-conservative. The calculated enthalpy and pressure in the pressurizer were used to determine the water relief rate. In WCAP-8330 a conservative enthalpy value (a constant temperature of 655°F was assumed) and the pressure of the pressurizer were used to determine the rate. Although in principle the calculation of the relief rate using both the enthalpy and pressure is acceptable, it is necessary to insure that the value of the enthalpy is not non-conservative. The relief rate is governed by the enthalpy of the water in the vicinity of the relief or safety valve. The average pressurizer enthalpy, if lower, is non-conservative for the over-pressurization (e.g., complete loss of feedwater) transient. The LOFTRAN code assumes complete mixing of the liquid in the pressurizer. This assumption, because of the sensitivity of the results to subcooling, may be non-conservative. If no mixing is assumed, at the beginning of the transient, relatively hot liquid corresponding to the initial conditions of the pressurizer will be discharged. After the depletion of the original pressurizer inventory, cooler liquid corresponding to the conditions in the hot leg will be discharged. Complete mixing of the liquid will decrease the average enthalpy and hence will increase the discharge rate. This would be non-conservative. Westinghouse should use the conservative assumption of no mixing in modeling the pressurizer relief rate.

In Reference 3, it is mentioned that a new option in LOFTRAN was used to calculate the pressure around the primary system loop. The following information is required to review this model:

a.) Details of the mathematical model used in the new option

b.) Indicate the assumptions made and justification to their use and conservatisms if any

c.) The calculational sequence used in the new option and how it fits with the overall calculational sequence in the LOFTRAN code.

d.) Experimental verification of the model used in the new option and

e.) Comparison of the results with the 80 psi that previously had been used to correct the pressurizer pressure with respect to the maximum reactor coolant system pressure.

References

1. Status Report on Anticipated Transients Without Scram for Westinghouse reactors, December 9, 1975.
2. Responses to Status Report Open Items For WCAP-8330, "Anticipated Transients Without Trip Analysis," transmitted by letter NS-CE-994 from C. Eicheldinger, Manager, Nuclear Safety, Westinghosue to Dr. D. F. Ross, Jr., Assistant Director for Reactor Safety, dated March 19, 1976.
3. Responses to open items directed to Westinghouse in the status report, transmitted by letter NS-CE-1116 from C. Eicheldinger, Manager, Nuclear Safety, Westinghouse to Dr. R. E. Heineman, Director, Divison of Technical Review, dated June 30, 1976.