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

November 24, 1996

Mr. Tom Greene, Chairman
Westinghouse Owners Group Steering Committee
Georgia Power Company
Post Office Box 1295
Bin 042
Birmingham, AL 35201

SUBJECT: ADDITIONAL INFORMATION REGARDING INCOMPLETE ROD CLUSTER CONTROL ASSEMBLY INSERTION

Dear Mr. Greene:

As a follow-up to the NRC/Westinghouse Owners Group (WOG) Information Meeting on October 24, 1996, the NRC staff would like to state the staff's current understanding of the Preliminary Westinghouse Root Cause Conclusions and to identify the areas of conflict between the Westinghouse position and the NRC position. In addition, the NRC staff wishes to acknowledge the WOG letter (OG-96-090) dated October 8, 1996. We have reviewed that letter and determined that it did not provide any information which would change the conclusions stated in our September 4, 1996 letter.

Westinghouse concluded that the worldwide experience of incomplete control rod insertion problems (other than those caused by debris, foreign material or control rod drive mechanism problems) indicated that all cases were related to excessive compressive loads on the fuel assembly guide thimble tubes. The NRC staff agrees with this conclusion. In each case the fuel assembly burnup appears to be an important factor.

While incomplete control rod insertion has only been experienced in a small number of fuel assembly designs to date, the NRC staff considers that all designs which incorporate small diameter thimble tubes need to be examined, since these small diameter thimble tubes appear to be susceptible to distortion and thus susceptible to control rod binding problems and high burnups.

The following are the areas of conflict between the Westinghouse position and the NRC staff position:

1) While the proposed root cause for the Wolf Creek incomplete RCCA insertions is a plausible explanation, it is not conclusive. The model for growth due to oxide accumulation is based on a very small number of data points and Westinghouse has stated that it is extremely sensitive to temperature. The model provides a possible explanation, but it has not been verified. Verification of the model would not be possible because data are not sufficient to establish confidence levels or sensitivity studies involving the key parameters.

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2) The Westinghouse explanation of the root cause for the Wolf Creek event has not been extended to the South Texas event and it is the staff's understanding that it can not be, since the accelerated growth observed at Wolf Creek was not observed at South Texas. The phenomenon appears to be dependent on a number of factors, the interaction of which is not clearly understood. Nothing in the Westinghouse explanation would preclude other fuel designs such as the 14X14 and 15X15 fuel from exhibiting similar behavior at different combinations of burnup, power history, core exit temperature, and other factors that might be important.

3) While fuel with Intermediate Flow Mixing grids (IFMs) would appear to be stiffer and thus less susceptible to distortion, it has not been shown that this fuel is not susceptible to thimble tube bowing from compressive loads. Furthermore, since the mid spans would be strengthened, the top and bottom spans might be left as the most suspectable portions of the fuel assembly and distortion of the top span could lead to control sticking very high in the core. Thus, the staff does not agree that plants with fuel assemblies containing IFMs are not susceptible.

4) While most of the high drag data reported as a result of Bulletin 96-01 has been in high temperature plants, there have been a number of cases of high drag in lower temperature plants, thus it is not clear that plants with T Core Hot < 615°F are not susceptible to thimble tube bowing.

5) As yet, no explanation has been given for the high drags measured in several types of fuel or the number of cases in which a dummy control rod could not be fully inserted into an assembly. It is our understanding that length measurements showed normal growth for these assemblies and thus excessive growth could not be the explanation for the distortion causing the high drag forces or inability to fully insert a dummy control rod.

The staff considers the potential for thimble tube distortion caused by high burnup and excessive compressive loads leading to incomplete control rod insertion an issue that needs to be addressed. In the absence of corrective actions that clearly eliminate the problem, the staff remains concerned. The safety significance depends on the amount of shutdown margin lost because of incomplete control rod insertion. Were the control rods to stick high in the core, the reactor could not be shutdown by the control rods, and other means such as emergency boration would be required.

At this time the NRC staff considers all fuel designs that incorporate a small diameter thimble tube to be susceptible to thimble tube distortion caused by excessive compressive loads. While the problem has only been observed in Zircaloy thimble tubes, the possibility of thimble tube distortion needs to be

addressed for fuel assemblies incorporating other materials. In light of this, the staff is anxious to work with the industry to develop corrective actions which will clearly eliminate the problem. These may need to be bounding interim operational or testing criteria until a more permanent solution can be established. In the mean time the staff is preparing a Generic Letter outlining our concerns and specifying actions to be taken until this issue is completely resolved.

Sincerely,

Brian W. Sheron

Brian W. Sheron, Acting Associate Director
for Technical Review
Office of Nuclear Reactor Regulation

Project No. 694

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Original Signed By:

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