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

December 12, 1996

Mr. Nicholas J. Liparulo, Manager
Regulatory and Engineering Networks
Westinghouse Electric Corporation
Post Office Box 0355
Pittsburgh, Pennsylvania 15230-0355

Dear Mr. Liparulo:

SUBJECT: NRC RESPONSE TO WESTINGHOUSE FEEDBACK ON PROPOSED FUEL MANAGEMENT GUIDELINES

The NRC staff has reviewed your letter of November 22, 1996, expressing Westinghouse's desire to be proactive in managing the incomplete rod cluster control assembly (RCCA) insertion issue. We understand that Westinghouse is investigating fuel assembly design alternatives for the purpose of increasing the mechanical design margins and reducing the susceptibility to incomplete RCCA insertion. We agree that a process to ensure protection against the possibility of an incomplete RCCA insertion is necessary.

We have reviewed the Westinghouse fuel management guidelines contained in your letter and have concluded that they do not fully address many of the staff's concerns as expressed at the various meetings on this issue between the staff and Westinghouse and the Westinghouse Owners Group (WOG). As a follow-up to the NRC/WOG Information Meeting which took place on October 24, 1996, we outlined the major concerns in a letter to the WOG Steering Committee Chairman dated November 24, 1996. These major concerns are as follows:

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.

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 susceptible portions of the fuel assembly and distortion of the top span could lead to control rod 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.

In addition to these concerns, the NRC staff has developed a detailed set of questions relating to fuel assemblies with IFMs. A list of questions is attached (Attachment 1). The NRC staff has reviewed the Preliminary Root Cause report (provided to the staff by an October 16, 1996 letter) and has developed a list of questions (Attachment 2).

We would like to emphasize that we consider the Wolf Creek and South Texas incomplete RCCA events related. Both are caused by thimble tube distortion caused by excessive compressive loads. 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. Means that are being taken to show that fuel designs are not susceptible to excessive compressive loads should be the focus of both short term and long term actions. We would also like to reiterate that fuel designs with IFMs or ZIRLO guide tubes have not been eliminated from susceptibility.

The final report on the incomplete RCCA insertion issue should address all of the concerns and questions discussed. Finally, considerable effort has been involved on the subject of proprietary material. We understand the burden on your staff associated with "correctly" marking the proprietary material. Further, we appreciate your perspective that to the extent information is merely available in pieces to the public, there is no additional benefit served by making it available again in a different context that would add

value to what was previously available to the public. Nevertheless, the importance of this material being made available to protect public health and safety means that we request the final report on the incomplete RCCA insertion issue be correctly marked as to what information is, in fact, proprietary.

Sincerely,

original signed by:

David B. Matthews, Chief
Generic Issues and Environmental
Projects Branch
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Project No. 700

Attachments:
As stated

cc: Mr. Andrew Drake, Project Manager
Westinghouse Owners Group
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QUESTIONS ON SUSCEPTIBILITY OF FUEL ASSEMBLIES WITH IFMS

1) What is the basis (in addition to lack of incomplete insertions) for the conclusion that fuel assemblies with IFMs are not susceptible? Please give full details and data to validate this claim.

2) Please present side by side comparisons of assembly growth for assemblies with and without IFMs. Since temperature and power history are such important factors, the assemblies compared should have the same temperatures and power histories.

3) Please explain why there would not be a temperature power history combination for which the top span and the bottom span would bow sufficiently to cause control rod sticking.

4) Plotting the Vogtle drag data and the North Anna data together indicates that there is greater drag for the IFM assemblies. Please explain how this is consistent with the position that fuel assemblies with IFMs are not susceptible.

5) Please give details of the Wolf Creek temperature and power history. How is it different from other power histories and temperatures?

Attachment 1

QUESTIONS ON THE PRELIMINARY REPORT

1) Please provide the technical justification for the susceptibility conclusions on Page 31 of the report. (Lack of incomplete RCCA insertion is not sufficient justification.)

2) The root cause conclusions for Wolf Creek stated that unusual growth is observed only in high temperature plants with certain power histories. Please specify the characteristics of this power history. How this will be avoided? How are you certain that only this power history can cause the problem?

3) The South Texas experience shows that high drag in the dashpot region alone is sufficient to cause incomplete RCCA insertion. This contradicts the conclusion that RCCAs will completely insert if one of the F spec criteria is met. Please explain.

4) There were several assemblies at various plants into which the dummy RCCA could not be inserted and thus no drag data was taken. The RCCA was fully inserted and drag data taken for all the Wolf Creek assemblies. Please explain why the thimble tube distortion on the assemblies into which the dummy RCCA could not be inserted is not as serious as that of the Wolf Creek assemblies. Since these assemblies did not exhibit unusual growth, what is the explanation for the excessive thimble tube distortion? Why would this not cause incomplete RCCA insertion?

5) The most likely root cause for the South Texas incomplete RCCA insertions was stated as "inadequate resistance to buckling in the fuel assembly design." Many other fuel assemblies at various plants exhibited high drag forces and thimble tube distortion in the dashpot area. Is the root cause for the distortion in these assemblies the same as in South Texas? Please explain your conclusion.

6) Please explain Westinghouse plans to mechanically strengthen the fuel assemblies in order to avoid thimble tube distortion.

7) It has been stated that the accelerated growth model was reviewed with "Non-Westinghouse experts (including GE)". Have you considered extending such an independent "peer review" to the overall mechanical model to validate confidence in it? How is creep handled in the mechanical model?

8) Please estimate the sensitivity of the influence of changing input parameters over a reasonable range to the model, if a full parametric study is not feasible, at least give an indication with reference to the irradiation growth model and the oxide growth model. What are the

estimated confidence limits on input curves to the model such as growth vs. fluence and their sensitivity to the current number of data points and the optimum number expected to be used.

9) Please provide growth data and strength data for ZIRLO to validate the claim that ZIRLO is not susceptible to thimble tube distortion.

10) Please explain why there would not be a power history and temperature combination for which accelerated growth would occur for ZIRLO.