Westinghouse Electric Corporation Power Systems

Nuclear Fuel Division

Box 355
Pittsburgh Pennsylvania 15230

Ref.: Letter D. Ross (NRC)
to C. Eicheldinger (W)
Dated November 23, 1976

NS-CE-1302

December 2, 1976

Dr. Denwood F. Ross, Jr.
Assistant Director for Reactor Safety
Division of Systems Safety
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Dr. Ross:

As indicated in the referenced letter, Westinghouse has had several meetings[1,2] with your staff on the effect of high burnup on fission gas release and the impact of increased rod internal pressure on safety analyses. We have already advised the Staff[3,4,5] of the results of detailed calculations performed with a fuel rod behavior model which recognized the increased fission gas release. These analyses demonstrated that fuel rod internal pressure will not exceed system pressure in any Westinghouse-designed fuel prior to March of 1977. Further, we have recently provided a detailed safety analysis[5] of limiting accidents which demonstrates that for the highest rated Westinghouse fuel, with high initial pre-pressurization, increased fission gas release will not have a significant adverse impact on accident consequences at any time in design life. We have requested timely review of these analyses by your staff.

In prior discussions with your Staff, Westinghouse has pointed out that it is inappropriate to attempt to "correct" a fuel design model by simply modifying one portion of the model. Because of feedback effects of fission gas release on such things as cladding creep and fuel temperature, an incorrect result will be obtained. We also emphasized that a very extensive effort has gone into our overall model revision to account for recent data and high burnup effects on helium solubility and fuel swelling and densification as well as fission gas release. Use of approximate correction factors to the previous design model cannot result in a predictive capability which is comparable to our revised model. Thus, Westinghouse argued, and the Staff agreed, that the suggested NRC stopgap measure should not be used to assess the fission gas release for Westinghouse fuel.

Westinghouse believes that the submittals already made to the NRC satisfy the needs for Westinghouse customers outlined in your letter. Since Westinghouse has experimental data and an analytical capability to deal with increased fission gas release there is no need to utilize the NRC equation. It follows, therefore, that the date at which the fuel reaches an exposure of 20,000 MWD/TU (item "a" of your letter) is of no consequence since the specified burnup merely serves to trigger the use of the Staff's correction factor if the vendor does not have a better modeling capability than that provided by the Staff model.

The meetings with your Staff and our recently-supplied safety analyses have discussed our most limiting fuel conditions of power, burnup and pre-pressurization. Therefore, our customers actual fuel conditions are bounded by these analyses. Consistent with your statement that such bounding calculations are acceptable, we will advise each of our customers to reference this letter to satisfy your request (items b, c, and d).

While these submittals are fully responsive to the Staff's request and, therefore, the need to employ the recommended NRC correction factor does not arise, Westinghouse believes it appropriate to re-emphasize our concern with two aspects of the Staff request. First, the error implicit in using a correction factor to only one portion of a fuel behavior model deserves re-emphasis. We have examined the proposed correction factor and have concluded that it leads to large predictive errors, particularly for fuel irradiated to high burnup at low temperatures. Under these conditions, errors of a factor of 5 have been noted.

Of even greater concern than the possible technical inadequacies of the NRC's suggested correction factor is the perception that the Staff is once again adopting the role of primary model developer for the industry rather than modeling solely for the purpose of regulatory review. Specifically, the data used by the Staff was publicly available to each of the vendors and could have been used by them, in conjunction with other data they may have had, to develop individual technical positions. In addition to any regulatory delay which may have been associated with the Staff waiting to develop an internal position prior to issue of the referenced letter, the Staff's action has discouraged the other vendors from performing an in-depth evaluation of their fission gas release models by providing an "acceptable" correction factor. Westinghouse strongly urges the Staff to reconsider the appropriateness of repeated actions(6,7) which have the effect of obviating the need for individual vendor experimental and analytical efforts.

Very truly yours,

C. Eicheldinger

C. Eicheldinger, Manager
Nuclear Safety Department

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Additional References

1. Westinghouse/NRC Meeting - September 16, 1976

2. Westinghouse/NRC Meeting - November 4, 1976

3. Letter C. Eicheldinger (W) to J. Stolz (NRC)
   NS-CE-1148, August 2, 1976, Revised Fuel
   Rod Internal Pressure Design Basis

4. Letter C. Eicheldinger (W) to J. Stolz (NRC)
   NS-CE-1262, November 2, 1976, Improved Analytical
   Models Used in Westinghouse Fuel Rod Design Computations

5. Letter C. Eicheldinger (W) to D. Ross (NRC)
   NS-CE-1290, November 24, 1976, Safety Analysis for
   the Revised Fuel Rod Internal Pressure Design Basis

6. Letter D. Ross (NRC) to C. Eicheldinger (W)
   September 15, 1976, Fuelograms for LWR Fuels

7. NUREG-0085, The Analysis of Fuel Densification