December 13, 2004

Mr. Robert H. Leyse
P.O. Box 2850
Sun Valley, ID 83353

Dear Mr. Leyse:

On October 25, 30, and 31, 2004, you sent a series of email messages to Nils J. Diaz, Chairman of the U.S. Nuclear Regulatory Commission (NRC), concerning the role of fouling in postulated reactivity-initiated accidents (RIAs). The purpose of this letter to respond to these emails.

In particular, you made repeated referrence to "Research Information Letter [RIL] 0401, An Assessment of Postulated-Reactivity Initiated Accidents for operating reactors in the U.S.," dated March 31, 2004, which stated that oxidation has a greater impact on RIAs than burnup. You then associate that statement with your own contention regarding cladding-to-water heat transfer, stating that fouling (i.e., crud buildup) has a greater impact than burnup. Although crud deposits would have some secondary effect on RIA behavior, your contention that fouling has a greater impact than burnup would not apply to RIA behavior, as explained in the following paragraphs.

We know that crud buildup, or fouling, increases the thermal resistance of a fuel rod and this, in turn, can accelerate corrosion (i.e., oxidation). Because RIA behavior strongly depends on oxidation, and crud buildup can accelerate oxidation, it is logical that crud buildup could have some effect on RIA behavior. Nonetheless, the test data presented in RIL-0401 included measured oxide thicknesses, and we presented our resulting correlation as a function thereof. In other words, we measured the total oxide thickness and used the resulting measures in our correlation.

Going one level deeper in technical detail, we can draw a further distinction between the effects of oxide and crud. Specifically, the oxidation process releases hydrogen, some of which is absorbed by the zirconium-based cladding alloy, where it embrittles the cladding and could lead to cladding failure during an RIA power transient. By contrast, crud sits on top of the oxide and does not produce any embrittling products that migrate into the cladding metal. Therefore, crud has only a secondary effect, as it provides some insulation and leads to slightly higher cladding temperatures that accelerate oxidation. Nonetheless, the correlation in RIL-0401 explicitly accounts for total oxidation, so crud has no additional effect and there was no need to account for crud deposits in that analysis.

Your third email message also referred to RIL-0401, contrasting it with several references to the first high-burnup fuel test (REP-Na1) in the French Cabri reactor. We believe that this test was affected by the unusual preconditioning of the test specimen, which resulted in hydride redistribution and reorientation, which caused the cladding to be exceptionally brittle and susceptible to failure. We, therefore, disregard that test as discussed in RIL-0401.

Nonetheless, your email message noted that a recent paper prepared by the Electric Power Research Institute (EPRI) reported that the Cabri team that conducted the REP-Na1 evaluation failed to reach a consensus concerning the validity of that test. The NRC staff and our contractor from Argonne National Laboratory were members of that REP-Na1 review team, and we are intimately familiar with the divided opinions. We also have an extensive basis for our conclusion that the REP-Na1 test was not representative. Moreover, we note that you did not express any concern regarding our conclusion, and the REP-Na1 controversy has no relation to your general concerns about fouling.

I hope that the explanation presented above will satisfactorily resolve your concerns about RIL-0401 and the role of fouling in postulated RIAs.

Sincerely,

/RA/
Carl J. Paperiello, Director
Office of Nuclear Regulatory Research

Nonetheless, your email message noted that a recent paper prepared by the Electric Power Research Institute (EPRI) reported that the Cabri team that conducted the REP-Na1 evaluation failed to reach a consensus concerning the validity of that test. The NRC staff and our contractor from Argonne National Laboratory were members of this REP-Na1 review team, and we are intimately familiar with the divided opinions. We also have an extensive basis for our conclusion that the REP-Na1 test was not representative. Moreover, we note that you did not express any concern regarding our conclusion, and the REP-Na1 controversy has no relation to your general concerns about fouling.

I hope that the explanation presented above will satisfactorily resolve your concerns about RIL-0401 and the role of fouling in postulated RIAs.

Sincerely,

/RA/
Carl J. Paperiello, Director
Office of Nuclear Regulatory Research

Distribution:
SMSAB R/F
DSARE R/F
JStarefos
M. Virgilio
W. Kane
P. Norry
W. Dean, AO
E. Merschoff
CGrimes
TClark, (2004395 and 2004396)
EDO R/F, (20040753 and 20040752)
SECY-LTR-04-0684 and SECY-LTR-040685

DOCUMENT NAME: E:\Filenet\ML043270361.wpd

Package: ML043410018
Attachment 1: ML043070362
Attachment 2: ML043070369

*See previous concurrence

OAR in ADAMS? (Y or N) Y ADAMS ACCESSION NO.: ML043270361 TEMPLATE NO. RES-006
Publicly Available? (Y or N) Y DATE OF RELEASE TO PUBLIC ________ SENSITIVE? N
To receive a copy of this document, indicate in the box: "C" = Copy without enclosures **"E"** = Copy with enclosures **"N"** = No copy

OFFICE	SMSAB*		C:SMSAB*		Tech Ed.*	N	D:DSARE*		D:RES*	
NAME	RMeyer:mb		PBaranowsky		PGarrity		FEltawila		CPaperiello	
DATE	11/24/04		11/24/04		12/01/04		12/2/04		12/13/04	