From: Jack Guttmann
To: Gruss, Kimberly, Lee, Henry, Ross-Lee, Mary Jane...
Date: Fri, Feb 11, 2000 7:39 AM
Subject: Re: ISG-11 Update, NAC-UMS MY approach

We need to convene the Wesflex Review Group with management.

The ramifications of high burnup fuel have not been fully explored.

Based on the meeting Kim had with SFPO technical personnel, it appears that the following issues have not been addressed:

1. Ductility, fracture roughness, and reduction in cladding wall thickness with respect to loading (e.g., buckling, material integrity under load). It appears that the structural analyses are based on new fuel geometry and material properties.

2. Source term considerations. Would one expect more fines and crud / corrosion buildup?

It is not clear that we have a problem. It is clear that these issues were not considered.

The potential for scheduler slippage still exist.

We may want to get BFS responses to these questions.

Jack.

>>> Henry Lee 02/10 8:33 AM >>>
David, Kim. and Jack:

I agree with your approach 100%. For Wesflex, the fuel rod buckling is evaluated based on unirradiated material properties. The unirradiated cladding material properties (e.g., yield strength and tensile strength) are lower than those of the irradiated cladding. So, Wesflex is conservative in this regard. Ductility and fracture toughness were not addressed. It is not too late to ask Wesflex to reevaluate fuel rod buckling capability based on ISG-11 update. Let me know if you think this is a good idea.

Henry

>>> David Tang 02/10 8:05 AM >>>
Kim/Jack, Based on the meeting yesterday afternoon for the high burnup fuel up to 50,000 MWd/MTU, the NAC-UMS Maine Yankee amendment review will take the following approach to reach closure for your responses to the two comments:

o Comment 1 - We will ask NAC to reevaluate fuel rod buckling capability on the basis of the reduced clad wall thickness by 80 microns.

o Comment 2 - PNNL will be requested by theTechnical Monitor to add a paragraph to discuss clad mechanical properties. We expect TER to conclude that the ductility and maximum

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percentage elongation remain essentially comparable for the fuel at 45,000 and up to 50,000 MWd/MTU.

I will ask other structural reviewers to comment the approach. You will hear from us if there is major reservation.

David

>>> Kimberly Gruss 02/03 9:38 AM >>>
David-
Thanks for your comments. Regarding comment 1... we have some information/data that shows a trend of oxide thickness versus burnup. I would be happy to share this information with you and the rest of your structural review group. Regarding comment 2... the "brittleness" of the cladding would be a function of the oxide thickness and characteristics of the hydrides that are present in the cladding. Our contractors at PNNL believe that brittle failures will be insignificant for fuels having less than 70 microns oxide thickness. Though, for fuels with 70-80 microns oxide, there is less certainty. I am planning on scheduling a meeting with the staff next week to discuss these issues. I will let you know when we meet.
Kim

>>> David Tang 02/03 8:55 AM >>>
Kim/Jack, A reduced wall thickness of 80 microns (80 x 1.0E-6 x 39.3 = 0.0032 ") will cause about a 14% reduction of the nominal wall thickness of 0.0225 " (0.1870 - 0.1645 = 0.0225", ISG-12). This amounts to a reduction of the clad moment of inertia by about 16%.

We need your help for the following two questions:

1. What is the incremental oxide wall thickness reduction, comparing the fuels at 45,000 MWd/MTU or less to the fuel at 50,000 MWd/MTU?

If it is just 10 microns, as I read it from the proposed revision, its effect on structural capability of the clad should not be significant.

2. Will the clad abruptly turn brittle, as supported by tensile coupon test data, for high burnup fuels?

If there is not much reduction in maximum percentage elongation, we need not revisit the current criteria and methodologies for evaluating fuel rod buckling strength.

David

CC: Easton, Earl, Hodges, M. Wayne, Huang, Daniel, ...