RAS 8316

Robert C Harvey
06/07/2004 04:25 PM

To: Steven P Nesbit/Gen/DukePower@DukePower
cc:
Subject: Paper

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August 9, 2004 (11:45AM)

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---- Forwarded by Robert C Harvey/Gen/DukePower on 06/07/2004 04:25 PM ----

"Nissley, Mitchell E." <nissleme@westinghouse.com>
06/07/2004 03:34 PM

To: "Robert C Harvey" <rcharvey@duke-energy.com>
cc: "Kobelak, Jeffrey R." <KobelaJR@westinghouse.com>
Subject: Paper

<<j2.pdf>>
This is from the Proceedings of the OECD/NEA/CSNI Special Experts Topical Meeting on LOCA Fuel Safety Criteria, Cadarache France, March 22-23, 2001. The paper was actually distributed earlier, as part of the NRC-sponsored High Burnup PIRT program. I commented on the expected significance of relocation in the following email:

<<RE: Apparent Contradiction>> j2.pdf
----- Message from "Nissley, Mitchell E." <nissleme@westinghouse.com> on Thu, 19 Oct 2000 12:28:22 -0400 -----

To: joe@anatech.com, alexandc@battelle.org, lehnuc@engr.psu.edu, nwaeckel@epri.com, bdunn@fra rdeveney@framatech.com, gerald.potts@gene.ge.com, jens.andersen@gene.ge.com, fmoody@golc wolfgang.wiesenack@hrp.no, georges.hache@ipsn.fr, joelle.papin@ipsn.fr, bboyack@lanl.gov, do sej@nfuel.com, hgrk03@nspco.com, richard.j.rohrer@nspco.com, toyo@nsrr.tokai.jaeri.go.jp, ATI keijo.valtonen@stuk.fi, k-peddicord@tamu.edu, tulenko@ufl.edu, "Risher, Daniel H." <risherdh@ <ROM@nrc.gov>

cc: Harold Scott <HHS.twf5_po.TWFN_DO@nrc.gov>, Sudhamay Basu <SXB2.twf5_po.TWFN_DC <nissleme@westinghouse.com>, "Ohkawa, Katsuhiro" <ohkawak@westinghouse.com>, "Ebeling- <derek.b.ebeling-koning@us.westinghouse.com>, "Blaisdell, John A. (Notes)" <john.a.blaisdell@ı

Subject RE: Apparent Contradiction

:

Reviewing the transcripts at page 288, the discussion had to do with the experimental simulation of fuel relocation effects on local power generation. I would agree that fuel relocation is a real phenomenon which could have a significant effect on whether or not the experiments are prototypic. Designing an experiment with external heating to simulate these effects would certainly be challenging. However, analyzing the effects in a reactor transient is more straightforward, and has been done by several organizations.

For the purposes of the analysis group, I think the ranking of "medium" is appropriate for high burnup UO2 fuel. Brent Boyack provided the following IPSN paper in his email of 6/27/00:

(same attachment, deleted for storage reasons)

Using a deterministic method similar to the US Appendix K approach, IPSN showed that high burnup UO2 fuel with relocation had margin to the 2200F/1200C cladding temperature limit. The residual ductile cladding thickness was also sufficient to satisfy the Chung and Kassner criteria for thermal shock

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Intervenor ✓ REJECTED

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Contractor DATE

Other Witness

Reporter Robin Allman

embrittlement. It was noted that more severe results would be obtained for low burnup UO2 or high burnup MOX.

Westinghouse has included fuel relocation effects on local power generation, fuel thermal conductivity, and gap conductance in its best-estimate + uncertainties large break LOCA model approved by the USNRC. When the analysis is done statistically, such that all parameters are NOT at their worst value simultaneously as done in a deterministic calculation, the burst node is typically non-limiting except in very high temperature transients. The 10 CFR 50.46 acceptance criteria are met for low burnup UO2 fuel.

The above supports the conclusion that "medium" is an appropriate ranking for high burnup UO2 fuel. A higher ranking for MOX may be appropriate.

Mitch

From: Ralph Meyer[SMTP:ROM@nrc.gov]
Sent: Friday, October 13, 2000 10:52 AM
To: joe@anatech.com; alexandc@battelle.org; lehnuc@engr.psu.edu; nwaeckel@epri.com; bdunn@framatech.com; rdeveney@framatech.com; gerald.potts@gene.ge.com; jens.andersen@gene.ge.com; fmoody@goldrush.com; lab@grs.de; wolfgang.wiesenack@hrp.no; georges.hache@ipsn.fr; joelle.papin@ipsn.fr; bboyack@lanl.gov; doug_pruitt@nfuel.com; sej@nfuel.com; hgrk03@nspco.com; richard.j.rohrer@nspco.com; toyo@nsrr.tokai.jaeri.go.jp; ATM2@psu.edu; keijo.valtonen@stuk.fi; k-peddicord@tamu.edu; tulenko@ufl.edu; Nissley, Mitchell E.; Risher, Daniel H.

Cc: Harold Scott; Sudhamay Basu
Subject: Apparent Contradiction

PIRT Participants,

During the LOCA PIRT meeting, we had discussions about fuel relocation = into the ballooned section of a fuel rod. This discussion starts on p. = 288 of the transcript.

In Category B, the experimental group ranked "Fuel relocation, residual = bonding and/or dispersal" as 7H, 0M, 0L and referred to this as a = "significant effect."

In Category C, the analytical group ranked "Fuel relocation" as 0H, 5M, 0L = and said it had a "modest effect on local linear heat rate."

My guess is that all the people who are concerned about this issue were in = the experimental group and that the analytical group ranked this too low. = Ballooning strains can be 100% (twice the diameter and four times the = area) such that relocated fuel could substantially increase the local = linear heat rate even though the rubble density would be less than the = original pellet density.

This is one of the issues that I am going to include in my writeup of =

implications and actions. Maybe we should re-visit this issue during the = discussions at the coming PIRT meeting. Please think about it. I have = reviewed some older information on this subject since the last PIRT = meeting and could mention that information in a discussion at the next = meeting.

Ralph