MEMORANDUM FOR: A. C. Thadani, Reactor Systems Branch, DSS

FROM: R. O. Meyer, Leader, Reactor Fuels Section, CPB, DSS

SUBJECT: AIF CONTENTION ON ATWS FUEL FAILURE CRITERION

This memorandum is in response to your July 25, 1978 note to M. Tokar on the subject above. The AIF statement on fuel integrity (on p. 27 of the enclosure to John E. Ward's July 13, 1978 letter to Joseph M. Hendrie) is inaccurate for several reasons, as outlined below.

The AIF contends that our proposed ATWS fuel failure criterion, namely that the number of failed rods should be taken as equal to the number that depart from nucleate boiling, (1) is overconservative, and (2) does not take appropriate advantage of fuel failure data based on test results. Regarding the first point, we have, in fact, proposed a relaxation of the present DBA thermal/hydraulic criterion, which requires that every rod that violates the current 95/95 DNBR limit (or MCPR safety limit) be considered failed (for dose calculation purposes). With the objective of providing a more realistic analysis of ATWS consequences, we have proposed instead that only those rods that are predicted to actually enter boiling transition be treated as failed.

The AIF contention also appears to ignore the fact that, for BWRS, the MCPR failure criterion is being retained as a means of bounding the number of rods that might fail because of pellet/cladding interaction (PCI). We do not currently have an applicable PCI failure criterion. For BWRs, where

the worst ATWS event is a reactivity-insertion event such as MSIV closure, we are, therefore, forced to compensate for PCI indirectly via a thermal/hydraulic limit. For PWRs, where no rods are predicted to violate the 95/95 DNBR criterion for any ATWS event, we simply require that an analysis be made of the likelihood for PCI failures resulting from reactivity insertion events. In effect, this would require the submittal of mechanistic analyses and arguments, along with experimental evidence, to show that PCI would not be a problem. Thus, the charge that the NRC staff has adopted a very conservative, or overly conservative, position, is without foundation.

The second AIF contention, that our ATWS fuel failure criteria do not take advantage of fuel failure data based on test results, is inconsistant with our call for PCI discussions (which should include vendor test data) and results from our generic PCI studies. So far, neither has resulted in the formulation of any PCI failure criteria that are applicable to design basis events. We have established a dialogue with the vendors in this matter, we are pursuing it via our technical assistance programs, and we welcome any assistance the vendors can provide.

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1. Staff estimates of capital cost are grossly overestimates.

Capital cost estimates were supplied by the vendors. Deficiencies noted, to the extent that they are real, are deficiencies in information supplied to the staff by the vendors.

2. Staff has not considered increased possibility of a LOCA and other transients.

Thadani should help on this.

3. Downtime: Not clear why staff says none; cost of downtime very expensive.

Staff points out that downtime is expensive; however,

a) Obviously no downtime for pre-CP plants; and

b) For CP and operating plants it is the staffs judgement that most work on the modification~~s~~ could be accomplished while the plant is operating, ~~and~~ final hook-up could be accomplished during a scheduled maintenance or refueling shutdown.

4. $1000/man-rem not appropriate.

Staff has both acknowledged that the appropriateness of $1000 per man rem is arguable and offered reasons for its use in App. XII Sect. 1.4.3.

5. [illegible] [illegible]. [illegible].

Without more detailed information from the vendors concerning their proposals for mitigative systems it is difficult for the staff to determine which prior experience is applicable. For example, while the staff is aware that the dose commitment for steam generator replacement could be about 1000 man-rem, based on what information has been supplied to us, we would expect the dose commitment for ATWS modification to operating plants to be relatively small. Obviously there would be no dose commitment for pre-CP and most CP plants.

6. Not clear how staff arrived at population doses. Input assumption for CRAC are not presented.

The population dose estimates are average or expected values of the difference in dose that would result from reduction of ATWS probability to 10^{-6} per reactor year. Thus each such value is the difference between sums over all accident scenarios of the product of probability of accident and resultant dose. The sums were calculated using [the] consequences model of the RSS (CRAC computer code). The 280 man rem figure is an average for the PWR and BWR of the RSS and is based on the assumptions of the RSS. The figures of 100 man rem for PWR's and 2400 man rem for BWR's use the RSS assumptions other than ~~for~~ [the] ATWS [RSS assumptions]. The staff ATWS assumptions are used.