Copy to: S. Fabic
N. Zuber
L. Shotkin
H. Sullivan

HERBERT S. ISBIN

2815 MONTEREY PKWY.
ST. LOUIS PARK, MN 55416
(612) 920-6417

Original return to Tong

June 29, 1980

To: Dr. Long Sun Tong
From: Herb Isbin

OBSERVATIONS, COMMENTS & SUGGESTIONS REGARDING
CODE ASSESSMENT

I have spent several days reviewing the material Novak and Stan sent to me, digesting the presentations and discussions at the two-day meeting in Silver Springs, and reflecting upon past and present perceptions for B.E. codes, and wish to offer the following remarks. The promptness of this response precludes a more formal, polished and detailed presentation. This response is limited to code assessment only. Please call me if you need clarification.

I. OBSERVATIONS

1. In general, the participants at the June 26+27, 1980 meeting reacted critically to Stan's approach for carrying out code assessment. The quality of the remarks of the participants ranged from very good to very bad! ["Very good" implies a strong technical competence; and "very bad", a lack of understanding of issues or just trivia.]

2. No single voice stood out among participants to provide an acceptable course of action. Stan's challenge for alternatives was incompletely and inadequately answered. It is doubtful whether further discussions by all present would have achieved any more benefit from interactions. The rearrangement of the agenda on June 27 was sufficient.

3. The main impact from this meeting must come from the written comments you receive, the weightings you give to the comments, and how you might restructure your code ASSESSMENT program.

8103180984

HERBERT S. ISBIN

2815 MONTEREY PKWY.
ST. LOUIS PARK, MN 55416
(612) 920-6417

CONTINUATION OF SECTION I

4. We need B.E. codes to

a) quantify in a "reasonable" way the safety margins inherent in the present licensing requirements

b) investigate possible improvements in ECCS and to optimize present ECC systems (i.e., accumulator pressure and water volume, discharge rates)

c) better follow the course of accidents so as to identify key parameters to be monitored and thus be better prepared to determine what actions should be taken if some additional failures of equipment and/or operator errors were to occur.

5. B.E. codes should be available NOW to follow the course of postulated accidents covering design basis accidents in LWRs involving LOCA for which

a) no fuel damage occurs

and b) only minimal fuel damage occurs

6. Future B.E. codes would include fuel damage, but we need to be careful in how far one needs to go NOW.

7. In items 4. and 5., all of us agree that a B.E. code must undergo independent code assessment which will characterize the "goodness" of the code and the applicability of the code to LWRs. We disagree on how this should be done.

8. I agree with Stan on the need for the four National Laboratories to participate in the independent code assessment. You are developing a pool of experienced and competent people who will assure in the future that B.E. codes can be used effectively. User differences are bringing out strengths and weaknesses inherent in the codes and in the application of the codes. Deficiencies are being recognized and eliminated. Users are contributing suggestions for improvements in BOTH codes and experiments.

HERBERT S. ISBIN

2815 MONTEREY PKWY.
ST. LOUIS PARK, MN 55416
(612) 920-6417

II Comments & Suggestions

1. My major criticism of Stan's approach for characterizing the "goodness" of the code is that the direction is too general, too grandiose, and will be coming too late. I recognize that his approach reflects tremendous insight and effort in conceiving a course of action. There are many good features. I am concerned with time and perpetuation of programs.

My approach is to limit what is accomplishable NOW and to come to some IMMEDIATE judgments. A longer range program is not included in my discussion here and is postponed for future activities.

2. Take all scenarios which are NOW part of the licensing regulations, and for which B.E. codes predict NO FUEL DAMAGE (when applied to LWRs), and carry out the code assessment. First, this means that B.E. codes are to be applied to generic or to specific plants. The NRC should seek reactor vendor and fuel supplier's cooperation, as well as involving EPRI and perhaps a few utilities in assisting and/or running the B.E. evaluations and code sensitivities.

Examine in detail all the features of the code output to see where code features involving two-phase flow, thermal-hydraulics and asymmetries are being "challenged" in the applications. On the basis of this intensive review of the calculated outputs and the selections of the "challenges" see what test results and experiments are available for checking the applicability of the codes. SCALING is not simply the plot of code "goodness" vs no. of fuel rods. For these scenarios of no fuel damage, tests with varying no. of fuel rods may not be an important feature!

Note the applicability of the code to LWRs and the characterization of the "goodness" of the code now become dependent upon the classification of the scenarios. Even within this classification of no fuel

HERBERT S. ISBIN

2815 MONTEREY PKWY.
ST. LOUIS PARK, MN 55416
(612) 920-6417

CONTINUATION OF II.2.

damage predicted by a B.E. code, there can be a few subgroups emphasizing different scenarios leading to different courses for the postulated accident with the view of being able to include item I.4.c., an important "lesson-learned" from TMI.

A modest effort on sensitivity analyses would be needed to characterize reasonable bounds for the B.E. outputs. I think trying to specify $Lim(\phi) - BE(\phi) = 2\sigma_{TOT}$ is not needed, at least for these scenarios and at this time.

In addition to the usual considerations for sensitivity analyses, a few carefully considered time-varying break sizes should be included.

3. Take all scenarios which are now part of the licensing regulations and for which the B.E. codes predict only minimal fuel damage when applied to LWRs and carry out code assessment. Minimal fuel damage is to be interpreted as some cladding oxidation, some ballooning of the cladding, and even up to some clad ruptures. The extent of the clad oxidation is not severe enough to be concerned about details of heat transfer nor of embrittlement of the cladding.

Repeat the details noted II.2. and determine the nature and extent of the "challenges" to the code, and examine in detail features for scaling the application of the code from tests to LWRs. For these scenarios, we now include in key results consideration of the number of rods (including location of the rods and of the damage) and the fuel rod damage (as noted above).

Note that in both II.2. and 3., the approach is to examine in detail the calculated outputs for these scenarios applied to LWRs and to become aware of how water in the primary system "behaves." Factors and features that begin to limit core coolability in the course of

HERBERT S. ISBIN



2815 MONTEREY PKWY.
ST. LOUIS PARK, MN 55416
(612) 920-6417

CONTINUATION OF II.3.

of each given accident scenario are sought. Grouping of scenarios might reduce the number of cases to be examined. For example, for large LOCAs, see what break size leads to more or threatens to lead to more fuel damage, and then concentrate on this break size for the sensitivity analyses.

Again select areas of "challenges", and with the experience of resolving II.2, develop the appropriate steps for II.3. Where fuel damage is incipient or occurs within the extent noted previously, the time-temperature measurements of electrically heated rods should be used to see how these values could be interpreted in terms of fuel damage. Of course, there are also reflooding tests with simulated blockages to introduce the effects of blockage, should this be necessary.

4. Obviously much more detail would be necessary, but for the purpose of responding to the meeting, this memo can be a start. The impact of my message is let's do what is accomplishable <u>NOW</u> in terms of an independent code assessment and settle for more modest, but practical and needed results.