

MEMO

March 6, 1980

TO: M.S. Plesset, ACRS  
FROM: I. Catton and T. Wu  
SUBJECT: Semiscale

*Ian Catton*      *Ted Wu*

A number of changes have been made in the Semiscale program. The program manager is now Larry Leach and the head of analysis is Gary Johnson with Willis Young representing DOE. It was made clear during the meeting that the data obtained from Semiscale would not be used directly for full scale plant assessment. Rather, the goal is to prove a code then use the code for full scale plant assessment. It is worth noting, however, that Semiscale results predict the behavior of LOFT better than any of the existing codes. Our overall impression of the Semiscale program was good. The program is much more focused and how it fits into PWR safety research is much better defined than one year ago. Plans to study plant transients are particularly timely. Harold Sullivan, WRSR, has done an excellent job. In particular, the question of scaling is being very well addressed.

The Semiscale and LOFT programs sponsor the development of RELAP5. This leads to a close relationship between the code developer and the experimental program. At INEL meetings take place between code developers, assessors, users and experimentalists almost twice monthly. This leads to a great deal of feedback. The code developer can influence the experimentalist as well as gain insight into the physical processes he is modeling. There is also a great deal of mobility between the different groups. This again leads to a more responsive code development program.

The analysis branch of Semiscale contains about 40% of the Semiscale technical personnel. Their function is to carry out pre-predictions of planned experiments. The result of their effort is that they a) predict correctly b) predict poorly and point out needs for the code developer which results in an iterative process or c) determine that proper models do not exist and postpone testing until a model is developed. This is a valuable process. It can, however, lead to indefinite delays as exemplified by lack of an UHI model. It is not clear that pre-predictions are always necessary.

A number of items came up during our visit that lead us to prepare a list of recommendations and suggestions for the Semiscale program. We would like to have you review them and if appropriate pass them on to Harold Sullivan. The recommendations and suggestions are as follows:

1. Use of plant transient data from Sequoyah tests to judge the usefulness of Semiscale is planned. The NRC Semiscale program manager should be involved with establishing the Sequoyah test plan and should insure that the data obtained are as complete as possible.
2. The Semiscale future test plan should consider transient behavior resulting from a steam generator tube rupture accompanied by an open steam generator relief valve. In particular, the control room symptoms and how quickly they can be recognized should be determined.
3. An overcooling transient needs to be differentiated from a SBLOCA. The possible use of a heat balance on the core and the steam generator could be explored with Semiscale.
4. The NRC program manager should pursue obtaining the help of Carl Michelson in future test plan formulation. This would bring not only his past experience to bear but also allow new LER data to be accommodated in a timely manner.
5. A part of the future plant transient type experiments should include investigation of possible mitigating actions and their worth. Particular attention should be given to their timing and to human factor aspects.
6. Natural circulation studies should be pursued only to the extent that they are part of an accident sequence of interest. Reliance should be placed on separate effects tests for details and modeling.
7. The present integration of RELAP5 code development into the Semiscale and LOFT programs appears to provide excellent direction to the code development effort. This approach should be incorporated into the other code development programs.
8. The planned series of Semiscale pump on-pump off tests should be augmented to allow parameterization of pump off time against core uncover. These additional tests should not be burdened with the usual requirements of pre-prediction and excessive data reduction.
9. The present data processing procedure appears to be excessively burdensome. A great deal of the data that is processed receives very little use. A serious review directed towards reducing the effort should be made.
10. The scaling effort described by Tom Larson at the meeting contains most of the essential elements needed to demonstrate the adequacy of the Semiscale facility. Some aspects such as the pumps may be difficult to scale but proper use of analytical tools should allow this difficulty to be overcome. Further efforts at dimensionless analysis and similitude studies are encouraged and should be valuable.
11. The use of disturbance analysis methodology to determine initial conditions and operational deviations during a transient should be encouraged. The lack of trained personnel is unfortunate. NRC WRSR should be encouraged to follow the methods used by others in supporting university educational research programs in this area.