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Dr. Tom Kress
Oak Ridge National Laboratory
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Dear Tom:

This letter is sent to you to summarize my thoughts about the ABWR Severe Accident issues presented by the GE staff and its consultants. Because of my teaching commitments I was unable to hear the initial presentations on primary containment and thermal-hydraulics. However, after reviewing the handouts nothing seemed very controversial. The severe accident analysis performed by the GE staff and its consultants seemed very reasonable as a broad investigation to glean the important aspects for more detailed investigations of specific issues. The use of MAAP as a parametric tool for this purpose also seems reasonable to me. Throughout the presentation it seemed clear to me that Dr.'s Buchholz, Gabor and Kenton recognized the limitations by MAAP in modelling the phenomena and attempted where possible to supplement the analysis. Nonetheless there were areas where further investigations seem warranted.

The subject of fuel-coolant interactions cannot be handled by MAAP. Therefore, the GE staff took a two-step approach. First, they claim that the ABWR is not substantially different from current LWR's and thus in-vessel energetic FCI's are still not an important threat to the containment from direct alpha-mode failure. Second, they claim that ex-vessel FCI's do not contribute to the risk of containment failure because water availability in the lower drywell before melt entry is almost nil. Both of these judgements seem reasonable to me, pending confirmatory research which indicates that mixing and energetics are limited (remember this lack of importance is based on judgement). However, there are issues that are not directly addressed by these arguments. First, the vessel and containment may be threatened by an energetic FCI which fails the lower vessel wall and this has never been considered. Second, if the probability of water flooding ex-vessel increases there is no methodology developed to handle this issue. Both this in-vessel and this ex-vessel issue have two common elements that need some careful thought given to them. First, the structural capacity of structural boundary must be assessed; whether it be the vessel wall or the pedestal wall. Second, a methodology to compute the dynamic pressures from the FCI should be developed. At this time quantitative numbers of such events are quite uncertain, but such analyses may be needed. Also the initial conditions for each situation must be carefully considered.

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The DCH analysis developed for the ABWR, although relatively simple and parametric, does a reasonable job of identifying the key behavior for a high pressure melt ejection event. I think the analyses clearly indicates the timing of the pressure rise and its coupling to the vent clearing to the wetwell. Dr. Catton noted that no analysis was done to determine the temperature history within the drywell and how that may compromise the seals at the penetrations. This omission should be corrected since it overlooks a wetwell bypass threat. Also the initial conditions used for the DCH analysis seemed to overlook the work done by SASM on the likely range of initial conditions. This also should be corrected based on the work by Dr. Sol Levy.

The MCCI analysis performed by the GE staff was also relatively simple, but in my view quite effective. Once again the major aspect of the ABWR design that allows for this simplicity is that water is expected to be reliably added to the lower drywell after the melt first enters this ex-vessel region. Except for the case of ex-vessel FCI's which was previously noted, this MCCI process would occur relatively benignly below a water pool. Thus debris coolability is not needed to show a low risk profile. I would suggest that the GE staff verify that they incur no major penalty if coolability cannot be assured and the basemat is eventually penetrated.

These are my major points relative to the ABWR. If you have any questions about the comments please give me a call.

Sincerely,

Michael L. Corradini
Wisconsin Distinguished Professor
Nuclear Engineering and
Engineering Physics
Mechanical Engineering

MLC:lcw

c: Dean Houston
ACRS