DEPARTMENT OF NUCLEAR ENGINEERING
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
77 Massachusetts Avenue Cambridge, Massachusetts 02139
Room: 24-207 (617)253-5119

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MEMORANDUM

To: M.S. Medeiros, Jr., Office of Standards Development, U.S. Nuclear Regulatory Commission, Washington DC 20555

From: C.D. Heising-Goodman, Nuclear Engineering Department, MIT, Room 24-207, Cambridge MA 02139

Re: Prepared Comments on 10CFR, Part 50: Domestic Licensing of Production and Utilization Facilities; Consideration of Degraded or Melted Cores in Safety Regulation Under "Specific Considerations", Questions 1 - 18

1. It is probably true that design changes could be made to mitigate against certain accident consequences -- whether these changes would be "practical" is somewhat dependent upon whether or not they are deemed "needed". This question involves performance of careful risk-benefit studies of various design alternatives. Obviously, underground siting of plants would tend to reduce risks; most experts would agree that this alternative is not very practical, particularly with regard to existing plants. Other suggested mitigation systems for hydrogen control, etc., such as filtered venting containments, etc., may or may not be practical. In fact, until studies are complete, it is hard to say whether these alternatives actually do reduce consequences -- they may in fact increase probabilities of certain accident events. In lieu of a government safety standard, it is rather difficult to make any specific recommendations regarding this design change or that, especially with regard to "practicality".

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2. Accidents beyond the current design basis should only be considered in addition to other areas if somehow in conjunction with this the existing licensing requirements are streamlined. Time after time, utility licensing engineers have stressed the need for a re-assessment of existing licensing analysis requirements. No one is specifically against considering accidents beyond the design basis given sufficient efficiency can be re-installed into the licensing analysis process. However, if by considering such additional accidents licensing analysis becomes even more complex, time-consuming, and seemingly without end, certainly many people in the industry will be opposed. My personal belief is that such a requirement should only be made if sufficient evidence can be shown to justify the added expense in manpower and financial resources it will require. Just what are the expected benefits of such a requirement?

3. The comments made in response to question 2 apply doubly strongly when one moves to consider requiring licensees to include the even less likely accidents involving core-melt. Justification must be fully made and substantiated beyond a reasonable doubt that such additional requirements are really necessary before the NRC should pursue such a requirement.

4. My own feeling is that prevention is far more important than mitigation alone. Perhaps some combination is optimal, but it would seem to me that an over-emphasis on mitigation systems means that our finitely limited financial resources available for design modification and change in general will be over-spent on this with a corresponding decrease/less attention on prevention. Operator training and re-assessment of control room lay-out, design and procedures would seem to be a reasonable expense in the prevention direction. Re-assessment of existing procedures for operator action also

seems a move in this direction. Too much emphasis on mitigation appears in my mind to give far less in actual returns in terms of actually increasing plant safety. However, these questions should be addressed in a quantitative, analytic manner in order to help clarify the issue.

5. To the extent that these systems can fail, either through human error or otherwise, these failures should be considered as was done in WASH-1400. Certainly, PRA methods are the only way to logically and as completely as possible analyze common mode failures, etc. These methods should be put to full use.

6. Until studies at Sandia and Studsvik are complete, it is impossible to recommend with confidence one way or the other how FVCS (filtered venting containment systems) should or should not be utilized. The exact design of such systems with regard to the modules that should or should not be included for the filtering of radioisotopes cannot be at this time specified with a great deal of confidence without such studies. Failure modes possible with such filtering systems need to be carefully analyzed, and such work is presently ongoing. It is perhaps possible to show probabilistically that an FVCS can ultimately be designed to actually reduce risk. The question is -- is this system warranted from a cost-benefit standpoint?

7. Hydrogen control systems should be studied for all containment types. Inerting has some drawbacks with regard to accident prevention that must be addressed (see response to #8). Other systems may prove better. Whether these systems should be required must again be determined from a risk-cost-benefit perspective. At this time, I have no personal preference toward any available H_2 control system, with the exception of inerting.

8. Absolutely not. Inerting has significant drawbacks related to operational disadvantages and increased health hazards to plant personnel. Should we continue to expose plant personnel to unneeded risks when some other H_2 control system can provide equal (or sufficient) protection without such serious side effects? I have enclosed a copy of our MIT study regarding nitrogen inerting in Mark-I containments. My opinion is based on this study -- additional studies should be performed based on PRA to try to resolve this issue. Reliance on only opinion without such supporting studies is not sufficient.

9. Core retention systems fall under mitigation systems and cannot be determined necessary without some recourse to studies that can calculate the reduction (increase) in risk resulting from such systems introduction. The particular design chosen must also be based upon additional studies that compare design advantages/disadvantages if the first study shows such systems are justifiable.

10. No Comment.

11. These recommendations make sense to me on the operator side. Increased reliability of emergency cooling or decay heat removal systems does not make as much sense, again for the reasons stated earlier regarding prevention vs mitigation. What should the trade-off between prevention and mitigation be seems a more appropriate question to be dealt with first before moving on to any specifics in design requirements or system add-ons.

12. Above response (#11) applies here as well.

13. No Comment.

14. I favor realistic estimation; the conservative approach provides upper bound estimates that are misleading more than they are helpful. Certainly, realistic bases should be employed.

15. Emphatically, YES; PRA can be used to do all those things and should be. Those who do not trust it are usually those who don't understand it sufficiently or who would prefer to rely on their own judgment -- however incomplete or erroneous that judgment might be. It seems to me that a combined effort, such as WASH-1400 employed, of expert studies, opinions, models, etc., gets you a whole lot further than none or little at all.

16. Yes -- comparative risk studies are necessary, useful and enlightening. Quantitative methods as employed in WASH-1400 and being extended at ORNL through NRC sponsorship with respect to risk analysis and assessments should be used.

17. Need to know better H_2 generation rate as function of accident sequence. Core coolability under degraded core conditions should be investigated further. Core-concrete interactions and H_2 flammability/detonation limits are needing further study.

18. Make emergency response variable with accident sequence. Compare siting requirements for various non-nuclear technologies with nuclear. Come up with quantitative basis for siting risk determination.