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Dr. Denwood F. Ross, Jr.
Deputy Director for Research
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U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

RE: Preliminary Comments on NUREG-1150, Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants (Second Draft for Peer Review), June 1989.

Dear Dr. Ross:

The purpose of this letter is to convey my preliminary comments on NUREG-1150, Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants (Second Draft for Peer Review), June 1989. As with the February 1987 draft of NUREG-1150, detailed review and comments will not be possible without access to the underlying detailed reports (NUREG/CR-4550 series, NUREG/CR-4551 series, etc.). Although drafts of these reports are indicated as being available from the NRC Public Document Room, a quite a number of them were not available as of the beginning of August 1989, including specifically the external events methods report (NUREG/CR-4840).

My principal comment based on my review to date deals with the subject of NUREG-1150's treatment of expert opinion. I'm sure you are aware that the results of NUREG-1150 could be quite sensitive the outcome of the expert elicitation process in a number of regards. It would be most useful if the NRC would expedite publication of those underlying technical volumes which describe in detail the approach used in the expert elicitation process and which contain the documentation prepared for and by the expert panels. This would allow reviewers the opportunity to become better acquainted with the expert elicitation process and to assess the degree of confidence one places in the outcome of that process.

More specifically, I suggest that it would be beneficial for NRC to conduct an experiment of sorts on the expert elicitation process. in particular, NRC should consider selecting a particularly important issue or two and empaneling perhaps three separate expert panels (including the panel used in draft NUREG-1150) and performing the expert elicitation process. This exercise would provide a useful calibration on the process to enable one to gain some appreciation as to the magnitude of variability that could be introduced into the risk estimates by the expert elicitation process. I would suggest that this be done on both front-end issues and back-end issues.

I have several additional comments based on my review to date. These are summarized in "bullet" fashion below:

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1. There are a number of places in the report where conclusions are stated or implied which conflict with the results of previous analyses. A key example is the degree to which a stuck open PORV depressurizes the reactor coolant system (thus avoiding direct containment heating which could arise from pressurized melt ejection) in PWRs. Previous analyses with which I am familiar suggest terminal RCS pressures of the order of 1000-1200 psig at the time of vessel breach. Morover, in the TMI-2 accident the operators tried to depressurize via the PORV to get the core flood tanks to discharge (pressure of 600 psig, as I recall), and were unable to do so. In contrast, the NUREG-1150 analysts either assume or have more recent calculations which caused them to conclude that the terminal pressure at vessel breach under these circumstances are much lower. The NRC should make available (or at least reference) the calculations which underly these conclusions/assumptions.

2. The Zion risk estimates in NUREG-1150 fail to include external events. As you are no doubt aware, such estimates are available from the Zion PSS (Commonwealth Edison/PLG, September 1980, the Zion Review (Sandia, May 1984, which identified a seismic station blackout as the 8th most likely sequence, at 5.6×10^{-6} per reactor-year), the SSMRP analysis of Zion (NUREG/CR-3428), and the LLNL seismic hazard estimates (NUREG/CR-5250). It would seem that a fairly minimal effort would be required to include the Zion external events in the risk estimates for NUREG-1150, and that this effort would be worthwhile for the final report. (The SSMRP report estimated a seismic core damage frequency of 3.6×10^{-6} per reactor-year on a point-estimate basis, and 3.0×10^{-5} per reactor-year on a median basis; presumably the mean value would approach the 90th percentile estimate of 8.0×10^{-4} per reactor-year. These calculations were done with the "old" LLNL hazard curves -- i.e., NUREG/CR-3756.)

3. The draft NUREG-1150 containment failure analysis considers steam explosions as a containment failure mode ("alpha-mode" failure). Such a containment failure probably represents only a small fraction of the total number of times a steam explosion actually occurs. It would seem plausible that there is another fraction of steam explosion events which, while not resulting directly in containment failure, would nonetheless result in impact on the containment which could weaken the containment and cause its failure from other causes (steam, hydrogen burn, etc.) at a later time during the accident progression. There is no evidence in NUREG-1150 per se that this eventuality has been addressed (perhaps this is discussed in the unpublished underlying technical volumes).

4. NUREG-1150 considered the risk posed by fires for Peach Bottom and Surry. This evaluation does not appear to have considered spurious actuation of fire suppression systems on the availability of plant equipment. There have been several NRC notifications to industry on this issue (IE Information Notices 83-41, 84-57, 85-85, and 87-14). This is also discussed in the Fire Risk Scoping Study (NUREG/CR-5088), which indicated that spurious suppression events are occurring at a rate similar to actual fires (it also indicated that this could be quite significant since those areas protected by fire suppression systems generally contain safety-related equipment). It would seem appropriate that NUREG-1150 address this issue to the extent feasible or discuss the rationale for assuming that it is not significant for the plants in question.

Further, NUREG-1150 mentions that the Peach Bottom cable spreading room uses CO_2 for fire suppression (NUREG-1150, Vol. 1, at 8-17). Spurious actuation of a CO_2 suppression system would lower the temperature of the cable spreading room dramatically, perhaps exceeding the environmental capabilities of components in the cable spreading room. NUREG-1150 should consider this possibility.

Finally, it should be noted that severe accident conditions (including initiating events or equipment failures resulting from HVAC failures, as well as the severe accident environment) could result in fire suppression system actuation. This should also be addressed.

5. NUREG-1150 does not appear to have addressed the potential for fires to be started as a result of seismic events. The Sandia Fire Risk Scoping Study (NUREG/CR-5088) recommends a walkdown to search for seismic/fire interaction possibilities. NUREG-1150 should address whether this was done for Surry and Peach Bottom, and, if not, why this is not important for these two plants.

6. As Jim Harding and I indicated in our comments on the previous version of NUREG-1150, there may be for multiple-unit plants a non-trivial likelihood of concurrent accidents at multiple-unit sites. This should be addressed in final NUREG-1150 since it could significantly affect risk estimates and cost-benefit analyses of risk management improvements. (This was addressed to a limited extent in the Sandia Zion Review; see NUREG/CR-3300, Vol. 1, at 4-31. It was also addressed in the Seabrook PRA.)

I expect that as more documentation becomes available I will have additional comments on NUREG-1150 (June 1989). It you or your staff have any questions regarding the above comments, please do not hesitate to call or write.

Sincerely,

Steven C. Sholly

cc: J. Murphy, NRC
E. Gorham-Bergeron, SNL
G. Thompson, IRSS