

STEERING COMMITTEE REQUEST
December 5, 2006, Steering Committee Meeting

THRESHOLD BELOW WHICH PHYSIOLOGICAL EFFECTS FROM RADIATION
IN A HUMAN POPULATION CANNOT BE DETECTED

Issue:

During the December 5, 2006, Steering Committee (SC) Meeting, the staff was challenged to evaluate the plausibility and impact of developing a process for presenting the State-of-the-Art Consequence Analyses (SOAR-CA) final results, latent and early fatalities, for each scenario across the range of dose, as a single distribution for each site. The guidance provided by the SC was to use an expert elicitation to determine a best estimate dose threshold and degree of uncertainty for latent cancer fatalities. The dose thresholds and uncertainty from each expert would be combined to provide a single value with a distribution of uncertainty equal to the mean, median, or some other weighted value. This would allow the NRC to present the results of the SOAR-CA as a single number of fatalities for each scenario analyzed at each site based on a technically justifiable calculated dose threshold. This single number of fatalities would be in contrast to presenting a different number of fatalities for each thresholds selected across a range of thresholds (0 to 5 Rem) for each scenario analyzed at each site. This approach will provide much clearer and usable results for many of the SOAR-CA stakeholders.

Response:

On December 12, 2006, in a conference call between the SOAR-CA project manager and members of Sandia National Laboratory MACCS team discussed this concept. The discussion led to an enthusiastic consensus that this would be a worthwhile effort. This approach involves a number basic concepts that have proven to be effective in other applications and should be achievable. This effort has the potential of providing better results for the intended SOAR-CA project, and better serving our stakeholders by providing clearer, more usable results.

Establishing a single distribution, in concept, is contrary to the linear no-threshold hypothesis (LNTH) and the different expert opinions on what is the right threshold to determine the consequences from latent cancer effects from radiation. Improving upon previous studies or developing a new technical basis to support, refute or develop a threshold for latent cancer effects within the context of the SOAR-CA project is unlikely and certainly is not one of its objectives. It is the NRC's position that cancer is a stochastic effect : health effects that are random, without threshold, and with an increase in the likelihood with an increase in exposure. Therefore, rather than performing an expert elicitation to consider the existence of a cancer induction threshold for use in the SOARCA project, the SOAR-CA team recommends performing an expert elicitation to identify a radiation dose threshold below which latent cancer effects are not detectable epidemiologically. This is, fundamentally, a different question that is still consistent with the SC direction. This approach will help to avoid a contentious LNTH debate and decouple this criteria for this consequence analyses (analyses of extremely low probability events) from criteria that might continue to be used for other regulatory purposes. By truncating the results at a single dose distribution developed from a cross-section of expert elicitation, the SOARCA will be able to provide a sound technical for its approach. The explicit implication will be, that to report consequences for doses less than the determined radiation dose threshold below which latent cancer effects in a human population cannot be detected, would not be reasonable or responsible.

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Process:

A procedure will be written and approved prior to the start of the effort. It may be helpful to the credibility of this effort to send this procedure to all identified SOAR-CA stakeholders and request comments. The process would include the following basic elements. A list of experts on radiation induced latent health effects will be developed. This list will include a good cross-section of experts and a sufficient number (TBD) of active participants from credible health physics organizations, academia, and technical authors, as appropriate. An elicitation letter will be written with very carefully crafted questions developed from an expert panel made up of NRC staff, national laboratory staff, and possibly a small number of outside experts. This letter will be forwarded to all the individuals on the list of experts requesting a response in a specified length of time. The information will be extracted from the expert elicitation and the single dose threshold for undetectable latent cancer fatalities will be calculated in accordance with the established procedure (e.g., use the mean, median, or other weighted values for production calculations and then explore the full distribution as part of the uncertainty quantification). A meeting will be held in Washington, DC with the experts, and other stakeholders to review the results and to obtain feedback. A report will be written to document the process, inputs, calculation, results, and conclusion.

Impact:

This is a significant undertaking. The results from this effort will serve as input to MACCS. MACCS runs are expected to begin as early as April of this year. If this effort is approved at the 01/10/2007 steering committee, it would need Commission approval. It is estimated that actual implementation would begin no earlier than February 5, 2007. Some preliminary work can be accomplished before this date, e.g., draft a strawman of the procedure and elicitation letter. However, the final development and approval of these documents would most likely not be completed before March. The elicitation process is estimated to take approximately 6 weeks and the extraction of the information and development of a single dose threshold for undetectable latent cancer fatalities will take another 8 weeks of effort to be approved. That brings us to the May time frame for the meeting of experts. The report development need not limit the use of the newly determined single dose threshold for undetectable latent cancer fatalities, therefore, it is estimated that developing this single dose threshold will impact the schedule by approximately 3 months.

The cost is estimated at approximate \$75 K. Assuming 12 experts participate and attend the meeting, it would cost an estimated \$25K in travel expenses and per diem. The rest of the cost reflects the support from the national laboratories in developing the procedure and elicitation letter, performing the calculations, supporting the meeting, and developing the report.

Current Actions:

We are currently collecting names of individuals that we would consider participating in the expert elicitation. All other actions are pending SC directions. It is recommended that we consider including this approach in future internal briefings to obtain a better understanding of the objective, process and benefits in proceeding with this effort.