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Mr. David H. Tiktinsky  
Engineering Branch  
Division of Waste Management  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

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DTiktinsky  
(Return to WM, 623-SS) C2

Dear Mr. Tiktinsky:

The following comments are in response to your request for review of the paper, "An Evaluation of Importance Measures for Probabilistic Risk Analysis Applications."

1. The paper is concerned with selecting the best importance measure for evaluating the contributions of events and components to the overall failure of high-level waste pre-closure activities. The assumption is that FTA is the basic analytic tool for assessing the safety of a system. This assumes that the process being evaluated is deterministic and that the constituent components and events are non-variable in their existence and their place in the system. This may very well be in an established pre-closure plan. However, I would expect other non-deductive safety analysis methods to be used simultaneously with FTA. Examples would be Preliminary Hazards Analysis and Failure Modes and Effects Analysis.
2. The evaluated importance measures are taken from Lamberts' 1975 work (Ref. 1). This was definitive and comprehensive in 1975. However, this is 1984 - a 9-year difference. It should be shown that the literature since 1975 offers no new viable Importance Measures. The same holds true for the Computer Code (1981) with input from Sets.
3. Page 3-3, 2nd paragraph. "In the examples shown, if we combine the calculated B-P and SC importance values, the resulting event ranking is the same as given by the F-V ranking (see Tables 2 and 3)." My reading of Tables 2 and 3 does not give the same ranking for the F-V measure as for the combined B-P and SC measures.
4. Page 3-4. The importance computer code cannot handle different repair times for initiating events and yet this is necessary for evaluating the event's effect on the systems failure. Does this indicate a compromise in the study to accommodate the code?


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5. I'm also troubled by Criterion No. 7, page 3-2, requiring a computer program be available to calculate the rankings. This is letting the availability of a computer code dictate your selection of an Importance Measure. It seems to me that a measure should be selected independently of and on other grounds than the availability or non-availability of a computer code to calculate it. Existence of computer code should only be a decision factor when the measures are equivalent in all other respects.
6. Page 3-5, Structure Measure. A FTA model accurately reflects the ordering of events and, therefore, a component event's place in the FTA is important. The reason given here - the undue influence of simple event minimal cut sets - does not seem adequate for ruling out the Structure Measure and it seems to defy Criterion No. 2, page 3-2.
7. Page 3-6, 2nd paragraph. "There is also a high-order minimal cut set with events that are not present in any other cut sets." Where is it? What is it? It needs to be pointed out, at least to this reader.
8. The mathematics seems fine except for a missing subscript, 'k', in equation 6, page A-3.

If you have any questions on my comments, please contact me at FTS 439-6880, ext. 308.

Sincerely yours,

  
John C. Kerkering  
Mathematician