

**From:** <Tomusafa@aol.com>  
**To:** <GXB1@nrc.gov>  
**Date:** Tue, Aug 29, 2000 9:15 PM  
**Subject:** Re: llnl figure

T. O'Hara, Duke Engineering  
G. Bagchi, NRC

Goutam - Here is an explanation of the headings.

Column 1 - the original LLNL numbering for each site

Column 2 - the ordered site number - it is meaningless and only used for plotting

Column 3 - Based on Kennedy's simplified approach, this is the LLNL probability of exceeding 1.82g at 2.5 hz - however, take note that the LLNL results and EPRI results are in terms of spectral velocity. Therefore, you need to convert the spectral acceleration of 1.82 g to spectral velocity [ $Sv = Sa/(2*3.14*f)$ ] in the calculation of the probability of exceedance values.

Column 4 - LLNL probability of exceeding 1.82 g at 5 hz.

Column 6 - LLNL probability of exceeding 1.82 g at 10 hz.

Column 7 - Maximum probability of exceeding 1.82 g at 2.5, 5, and 10 hz.

Column 8 - Based on Kennedy's simplified approach, the maximum value determined in Column 7 is adjusted by a factor of 0.5. Therefore, Column 8 is the estimate of SFP failure frequency based on use of Kennedy's simplified method and the LLNL seismic hazard results.

Column 9 - Using exactly the same methodology the EPRI results were calculated. The Column 9 result is exactly the same as the Column 8 results, except that the EPRI hazard curves were used. This was done in a separate spreadsheet and the results were merged into this spreadsheet. So Column 8 and Column 9 are direct comparisons of the estimated SFP failure frequency based on the Kennedy simplified methodology and the LLNL and EPRI seismic hazard curves.

Column 10 - This is simply the arithmetic average of Column 8 and Column 9. If no EPRI results, Column 8 is simply divided by 2. As you know, the arithmetic average of LLNL and EPRI is LLNL.

Column 11 - This is the geometric average of columns 8 and 9. The geometric mean is the anti log of the average of the logs. What it really is, is the middle probability of the LLNL and EPRI SFP values which is reasonable, given that both studies are considered credible. If only LLNL, then the geometric mean is LLNL. It should be recalled that the arithmetic mean hazard curve is really a weighted arithmetic mean hazard curve. If the PRA side wants to go with an arithmetic mean of LLNL and EPRI then I propose that it be a weighted arithmetic mean - with a weight of 0.125 given LLNL and 0.875 given EPRI. I will provide you with the basis for these weights. This gets them away from their heartburn with the geometric mean, yet gives you the same numbers as the geometric mean.

Column 12 - This is simply used for plotting purposes. Kennedy floated 3e-6 as an acceptable value and I am simply using it to plot a straight line on the figures.

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Column 13 - BWRs are specified as 1, and PWRs are specified as 2. This is nice to know information.

Column 14 - Site names which you may or may not have.

Goutam, I also think that there needs to be a compelling discussion concerning how decisions should be made given that both deterministic and probabilistic information is available. Satisfaction of your seismic checklist along with past licensing decisions and detailed geological and seismological studies provide a high degree of certainty that seismic is essentially a negligible risk for most CEUS NPPs. The probabilistic numbers are low, however, confidence is derived from the deterministic information.

Goutam - if you need additional information do not hesitate to call or e-mail me. I still think you need to truncate your consultants and get some fresh views.

Tom O'Hara