Input to NEI Letter of 4/28/99

The use of the latest hazard curves from NUREG 1488, Revised Livermore Seismic Hazard Estimates for 69 Nuclear Power Plant Sites East of the Rocky Mountains, should generally result in reduction in the seismic hazard for a vast majority of sites, but there are exceptions. A significant point that needs to be recognized is that essentially all spent fuel racks are now high density and free standing. The factor of 0.25 of zircalloy fire, given a structural failure of the pool is no longer true for BWR plants. Many of these assumptions from NUREG 1353 need revision. NUREG 1353 study used a surrogate fragility and did not attempt to investigate failure modes that could result in structural failures at a lower level of excitation.

The structural failure modes that need scrutiny involve impact with adjacent structures, failed superstructure and equipment, impact of high density racks on BWR pool floors following uplifts at high levels of excitation, effect of stiffness reduction due to cracking at high levels of excitation, effect of preexisting cracks in pool liners, effect of uplift and slap back of PWR pool slabs on foundation.

We have made a preliminary review of the claim by NEI of reduction in seismic hazard by factors of 5 and 10 for the Robinson and the Vermont Yankee sites because these two sites formed the basis for the conclusions drawn in NUREG 1353. We have determined that for a peak ground acceleration value of 1.0 g at the 50 Th percentile level there is no change in the two hazard curves, the 1989 and the revised 1993 LLNL estimates, for the Robinson site, and there is a little less than a factor 2 for the Vermont Yankee site at the 1.0 g level. At higher seismic fragility values, 1.2 g for Vermont Yankee and 2 g for Robinson, the difference is expected to be negligible. We also note that large differences between the two hazard estimates, 1989 and 1993 LLNL, occur at the mean level. With the seismic hazard factors being so low at large ground motion levels, we believe that the focus ought to be in a risk informed performance goal as suggested below.

Any future study to obtain a more realistic assessment of seismic failure frequency needs to focus on the combination of fragility and hazard evaluation based on the consideration of LLNL and EPRI hazard on one hand and a fragility estimate using critical failure modes on the other hand. The results from such a study can then form the back bone of a risk informed rule making decision. However, based on the site to site differences in spent fuel pool layout and design, structural dimensions and large range of failure modes, the staff believes that it is prudent to rely on case by case seismic capacity estimate. If the seismic capacity can be shown to be at least equal to 3 times the SSE for a plant, the staff judgement is that the seismic issue can then be eliminated from further consideration. The use of SSE as a bench mark takes into account the site specific hazard and eliminates additional efforts needed to develop the fragility curve and then convolution of the hazard curves with the fragility curves. This can serve as a risk informed performance goal and ensure that seismic induced zircalloy fire frequency is adequately dealt with.

Goutam Bagchi
Robert Rothman
P:\nei428.wpd

B/151