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Submitter Information

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General Comment

Attached are comments and some thoughts regarding risk assessment guidance.

Attachments

DG1322

SUNSI Review Complete
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Disclaimer

The comments in here are solely the author's and do not reflect or in any way represent the views of any other individual, institution, organization, enterprise, or group of individuals.

Comments

1. The regulatory guide is well written and consistent with other similar regulatory risk guidance.

2. Thoughts prompted from review of DG 1322 and use of other risk guidance follow that, if considered in the longer term, may be helpful to investigators as new guidance is developed and existing guidance is revised:

   (a) Consideration might be given to how much emphasis is placed on frequency of core damage and frequency of large radiation release in guidance.

      i. For example, regarding DG 1322, the frequency of a sufficiently large loss of coolant accident that progresses to the recirculation phase and then results in core damage due to clogging up systems, structures, and components is clearly very small (of the five core damage events in roughly 15,000 reactor years of commercial reactor operation worldwide, none are from this scenario). It seems that unless there is something fundamentally wrong with modern design standards, typical probabilistic risk assessment of these values will inevitably be small.

      ii. Scenario results and subsequent analysis may have more usefulness for decision-making regarding design alternatives than core damage and large early release. For example, 'risk curves' might be more useful for industry and USNRC investigators when evaluating design alternatives and risk of vulnerabilities in adopted designs. That is, it seems we are concerned with the significance of the various problems that may arise in design alternatives rather than these frequencies. A parallel example (found in academic literature) may be regulations requiring large ocean liners to carry lifeboats. Even though it is unlikely that providing lifeboats is justified based on the frequency of sinking, they are included to reduce (although not eliminate) the loss of life in case of an accident.

      iii. The abscissas in the ΔCDF, CDF and ΔLERF, LERF figures in Regulatory Guide 1.174 probably (for many reasons) do not meaningfully represent absolute risk values. For example, organizational risk contribution (not human reliability), known to be at the root cause of core damage events and in fact most major industrial accidents, is not explicitly included in regulatory risk guidance. The requirement in Regulatory Guide 1.174 'Over-reliance

on programmatic activities ...' seems to be aimed at the issue but is part of guidance on defense in depth, as opposed to an explicit requirement of the risk assessment.

(b) Some consideration could be given to adding clarity to guidance on uncertainty as it applies to risk assessment versus design uncertainties.

   i. The motivation here is that safety margin is already included in design standards to account for uncertainty in the design models, manufacturing errors, and so forth. Also, design uncertainties as included in the design of components (systems, structures, components) is intentionally biased for each individual performance consideration.

   ii. Based on very limited experience with GSI-191, the author has the impression that there is an expectation that risk assessment should include similar bias uncertainty as well. If followed, such practice could cause unrealistic assessments of risk and possibly lead to wrong conclusions regarding design alternatives. That is, it seems the risk assessment should evaluate the integrated design realistically 'as designed' with unbiased uncertainties and thereby avoid double-counting of safety margins. This approach may provide the best chance of revealing vulnerabilities in the integrated design otherwise missed in individual component designs.

(c) Consideration should be given to removing defense in depth and safety margin from regulatory risk guidance in regard to the following thoughts.

   i. It seems that compliance with defense in depth and safety margin is fundamentally required in long-standing regulatory design requirements and the concepts lie outside the domain of quantitative risk assessment.

   ii. Defense in depth and safety margin appearing in risk assessment guidance may cause confusion among USNRC and industry investigators and could wrongly be interpreted to imply a weakening of those long-standing requirements.

   iii. It seems that the risk assessment should be clearly identified as 'an addition to' existing engineering design standards. That is, alternative designs should already comply with design standards such as general design criteria. The risk assessment should then provide additional information to help decision-makers choose the best (in their judgment) design choice.

Wrap up

The draft guidance is well written and consistent with other similar guidance in USNRC regulations and should work well for industry investigators.

Some thoughts that may differ or even contradict mainstream views on regulatory guidance and development of regulatory guidance are offered. Some of the academic literature reviewed in support of these thoughts is included in the bibliography. As new guidance is developed and existing guidance is revised, consideration of these thoughts may help reduce confusion and enhance effectiveness of regulatory guidance.

Bibliography

Catchpole, K. and D. Wiegmann (2012). Understanding safety and performance in the cardiac operating room: from 'sharp end' to 'blunt end'. *BMJ Quality & Safety 21*(10), 807 – 809.

Doorn, N. and S. Hansson (2011). Should Probabilistic Design Replace Safety Factors?. *Philosophy & Technology 24*(2), 151 – 168.

Faber, M. and M. Stewart (2003). Risk assessment for civil engineering facilities: critical overview and discussion. *Reliability Engineering and System Safety 80*, 173 – 184.

Hansson, S. (n.d.). A philosophical perspective on risk. *AMBIO 28*(6), 539 – 542.

Kaplan, S. (1982). Safety goals and related questions. *Reliability Engineering 3*(4), 267–277.

Kaplan, S. and J. Garrick (1981, March). On The Quantitative Definition of Risk. *Risk Analysis 1*(1), 11–27.

Schröder-Hinrichs, J.-U., E. Hollnagel, and M. Baldauf (2012). From Titanic to Costa Concordia–a century of lessons not learned. *WMU Journal of Maritime Affairs 11*(2), 151–167.

United States and J. G. Kemeny (1979). *The need for change, the legacy of TMI: report of the President's Commission on the Accident at Three Mile Island, John G. Kemeny, chairman.* Washington, D.C.: s.n. : for sale by the Supt. of Docs., U.S. Govt. Print. Off.