



Contribution ID: 427

Type: **Oral**

Basis for Regulatory Requirements for Design and Safety Analysis of Reactor Facilities

In this paper, we evaluate the current requirements and criteria for reactor design and safety analysis in being risk informed. Specifically, we focus on high-level objectives asserting that risks posed by a nuclear facility need to be comparable to the risks to which people are normally exposed; and are lower than those from alternative methods of generating power.

We investigate the key metrics and elements for comparative risk assessments to establish a benchmark for “reasonable risk” through modification of the quantitative safety criteria. We emphasize the importance of comparing the reactor facility risks and benefits per unit of output against those of alternative means of producing that energy. Additionally, we identify that cumulative risks from design basis accidents are not fully captured in current deterministic safety criteria.

Based on the arguments presented in this paper, we recommend the following:

1. Risk criteria should be set in terms of energy output rather than “per reactor”.
2. Risks posed by reactor facilities should be compared with those from other viable methods of electricity generation.
3. A cumulative risk target should be established to account for the overall risks from the number of postulated accidents within the design basis.

Country OR International Organization

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Track Classification: Topical Group B: Legislative and Regulatory Frameworks: Track 7: Regulatory Considerations for SMRs