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Human Factors Reliability Analysis for Assuring Nuclear Safety Using Fuzzy Fault Tree

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Synopsis

In order to ensure effective prevention of harmful events, the risk assessment process cannot ignore the role of humans in the dynamics of accidental events and thus the seriousness of the consequences that may derive from them. Human reliability analysis (HRA) involves the use of qualitative and quantitative methods to assess the human contribution to risk. HRA techniques have been developed in order to provide human error probability values associated with operators'tasks to be included within the broader context of system risk assessment, and are aimed at reducing the probability of accidental events. Fault tree analysis (FTA) is a graphical model that displays the various combinations of equipment failures and human errors that can result in the main system failure of interest. FTA is a risk analysis technique to assess likelihood (in a probabilistic context) of an event. The objective data available to estimate the likelihood is often missing, and even if available, is subject to incompleteness and imprecision or vagueness. Without addressing incompleteness and imprecision in the available data, FTA and subsequent risk analysis give a false impression of precision and correctness that undermines the overall credibility of the process. To solve this problem, qualitative justification in the context of failure possibilities can be used as alternative for quantitative justification. In this paper, we introduce the approach of fuzzy reliability as solution for fault tree analysis drawbacks. A new fuzzy fault tree method is proposed for the analysis of human reliability based on fuzzy sets and fuzzy operations t-norms, co-norms, defuuzzification, and fuzzy failure probability.

Country or International Agency

Egypt

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