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Extending Health Considerations in Generation/Transmission Power System to Include Uncertainty Using Fuzzy Data

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Abstract
The basic objective of a modern power system is to satisfy the system load requirements as economically as possible and with reasonable assurance of continuity and quality. The currently available reliability assessment techniques can be divided into two distinct categories of deterministic and probabilistic techniques. The reliability parameters such as failure and repair rates of components used in the probabilistic models, there is considerable data uncertainty that exists in these parameters. Forced outage rate, is affected by two uncertain factors mainly, in case of two state models, such as failure rate and repair rate, it is appropriate to apply fuzzy mathematics to solve this problem. The a-cut of fuzzy mathematics model is used by considering the membership grade in a fuzzy set. The coupling between the presumption level and the confidence interval will be a popular way to define the concept of uncertain data of fuzzy numbers. The concept of fuzzy number (FN) has led to the development of fuzzy mathematics, has the capability of dealing with uncertain data in normal calculation. In this paper a framework to evaluate health analysis of the generation/transmission system by incorporating the fuzzy approach is suggested. The mathematical models of different parameters based on fuzzy concept are developed. The proposed methodology is tested on composite power system, to demonstrate the effect contingencies and uncertainties on power System health indices. The analytical results can serve as operating guide to the system operator.

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