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TRANSMISSION EXPANSION PLANNING CONSIDERING AMBIGUITIES USING FUZZY MODELING

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Abstract. *This paper proposes the use of fuzzy set theory to deal with the problem of choosing the best transmission system expansion plan (TSEP) considering the permissibility and ambiguity of the investment budget for constructing new transmission lines and the delivery marginal rate of the system (reliability criterion) when only a very limited size database is available to evaluate reliability indices. This is the same as solving the TSEP problem for the highest satisfaction level of the decision maker. The proposed approach models the transmission expansion problem considering practical ambiguities as a fuzzy integer programming problem. It uses the branch and bound method that utilizes a network flow approach and the maximum flow-minimum cut set theorem. The resulting optimal strategy is a reasonable and flexible plan that would not significantly change due to changes in the surrounding situation. Test results indicate viability and effectiveness of the proposed techniques.*
Keywords: Transmission expansion planning, Intelligent system

1. **Introduction.** Transmission system expansion planning (TSEP) addresses the problem of broadening and strengthening an existing transmission network to optimally serve a growing electricity market while satisfying a set of economic and technical constraints [1,8]. The problem is to minimize cost subject to a reliability level constraint. Various techniques including branch and bound, sensitivity analysis, Bender decomposition, simulated annealing, genetic algorithms, Tabu search, GRASP, among others have been used to study the problem [9-30].

While the primary function of a conventional power system is to provide electrical energy to its customers economically and with an acceptable degree of continuity and quality, in competitive electricity markets, the main focus of the system owners is to maximize profit [2,3]. In the case of the latter, there exists more ambiguity of investment budget for