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Research Article

A Single Stage Dynamic Transmission Expansion Planning Model in the Competitive Market

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Abstract

Transmission Expansion planning (TEP) recommends the most beneficial investment to construct/ reinforce the power system. In this short or middle time planning the annual load growth of the power system must be met considering the stability, security and reliability of the network. In the competitive market the planners can include market behavior in the TEP to manage the congestion. Before traditional TEP, the local marginal pricing (LMP) is calculated offline without considering the dependency of the LMP to the network topology. But, the LMP is not constant during the TEP and must be included in the model dynamically. Here, the dynamic dependency of LMP to the transmission system topology is modelled as a single stage mixed-integer linear programming and solved by YALMIP and MOSEK software. The proposed model is more realistic; however, it takes more computation time. The single stage means the simultaneous calculation of LMPs and expansion planning in the model. The model has been applied to Garver 6-bus and the IEEE 24-bus network. The effect of interest rate, the load to generation capacity factor and load growth on the TEP model are analysed. The model considers the contingency of line outages and presents a robust solution to guarantee the system security. It offers flexible solutions with higher cost.

Keywords: Transmission Expansion Planning, Competitive Market, Local Marginal Pricing, Line Congestion.

Highlights

- Presenting a new MILP model of Transmission Expansion Planning in the competitive market
- Presenting a dynamic Local Marginal Pricing (LMP)-based Planning without computing the LMP separately
- Integration of two optimization solver called MOSEK and YALMIP to accelerate the computation accurately
- Implementing the model in Garver 6bus and IEEE 24bus networks
- Considering the contingency and present a robust model

Citation: , (in Persian).