MARKET BASED TRANSMISSION PLANNING

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ABSTRACT

Restructuring and deregulation subjected the planner of transmission to fresh goals and uncertainties. For transmission planning in deregulated settings, fresh criteria and methods are therefore required. This article presents a fresh market-based approach to transmission planning in deregulated settings. This research's primary input is: To introduce a fresh probabilistic instrument, planning and defining a new market-based criterion and to develop a new approach for transmission planning in deregulated environments. This approach helps in encouraging competition, access to cheap electricity and planning risk assessment solutions for various uncertainties.

Key words: transmission, planning, risk assessment.

INTRODUCTION

There are usually two differences between planning in regulated and deregulated environments. The primary goal of transmission planning[1] in deregulated energy systems is to provide all stakeholders with a nondiscriminatory and competitive setting while preserving the reliability of the energy scheme.

The extension of transmission unfairly impacts market participants interests and this should be taken into account while performing transmission planning. Few objectives are to be followed while performing transmission planning is:

1. To provide fair supply storage for generators and fair demand side storage for all consumers.
2. The generated power should be value based rather than cost based.
3. Encouraging competition among participants in the same field.
4. To provide a steady network in spite of all the uncertainties.

MODEL OVERVIEW

This approach deals with the identifying the un-random uncertainties. Each scenario is given a degree of significance. The likelihood distribution function (pdf) of each input with random uncertainty is determined for the maximum scheduling horizon load to model the random uncertainties. The nodal price pdfs are calculated using Monte Carlo simulation[2] in each situation. Some development plans (candidates) are then proposed for brand-by brand transmission planning.

LOCATIONAL MARGINAL PRICES (LMP)

An electric market performance can be evaluated by evaluating nodal price pdfs or LMPs[3]–[5]. By definition, "LMP is the cost of providing next MW of load at a particular place, taking into account marginal cost of generation, congestion costs of transmission, and losses". The ideal load flow is used to calculate LMPs for a specified operating point. LMPs are multipliers of Lagrange[6] or shadow prices of power flow constraints.

MARKET BASED APPROACH

In order to achieve the goals of transmission expansion planning in deregulated environments, some criteria need to be defined to measure how competitive an electric market is and how much a particular expansion plan improves competition. All manufacturers give their products at the same cost in a stable, perfectly competitive market and customers have no restriction on buying from their favorite products. Therefore, LMPs need to be made equal in order to have a competitive electric market and congestion needs to be alleviated.

CONCLUSION

A new probabilistic instrument is introduced in this study to compute the probability density functions of nodal prices. For transmission planning in deregulated settings, new market-based criteria have been described.

REFERENCES

[1]   T. K. Ishii, "Transmission lines," in *Feedback, Nonlinear, and Distributed Circuits*, 2009.

[2]   A. K. Chattopadhyay and T. Chattopadhyay, "Monte Carlo simulation," in *Springer Series in Astrostatistics*, 2014.

[3]   A. J. Conejo, E. Castillo, R. Mínguez, and F. Milano, "Locational marginal price sensitivities," *IEEE Trans. Power Syst.*, 2005.

[4]   J. M. Morales, A. J. Conejo, and J. Pérez-Ruiz, "Simulating the impact of wind production on locational marginal prices," *IEEE Trans. Power Syst.*, 2011.

[5]   A. Papavasiliou, "Analysis of distribution locational marginal prices," *IEEE Trans. Smart Grid*, 2018.

[6]   M. Parker, "Lagrange Multipliers," in *Solid State and Quantum Theory for Optoelectronics*, 2009.