shown that an individual supplier can optimize its own benefit by fine-tuning its minimum output and price when there are only a few suppliers dominating the market. A fairly thorough theoretical analysis of the bidding for minimum output is illustrated with a numerical example.

Practical Cost-Based Approach for the Voltage Ancillary Service

Da Silva, E.; Hedgecock, J.; Mello, J.; Luz, J.

Author Affiliation: UFSC-Federal University of Santa Caterina, Brazil; Power Planning Associates; Electric Power Research Center; National Electric System Operator

Abstract: The restructuring and deregulation of the electricity sector most noticeably involves the introduction of competition into energy supply. In parallel with this, however, there is an increasing desire amongst transmission system operators, generators, and consumers for commercial principles to be applied to transmission services, including the provision of voltage support and reactive power control. The identification of the costs of providing such services is an important first step towards developing a transmission services market. Implementing a payment structure based on the remuneration of incurred costs can be an attractive option to commercial power sector players, who wish such costs to be recoverable at an appropriate rate of return, and system operators, who need to be assured of the availability of the necessary services. This paper addresses both the principles and practical issues involved in developing cost-based payments for reactive power, with reference to the ongoing restructuring of the Brazilian power sector.

The Economic Dispatch with Consideration of Transmission Service Charge for a Generation Company

Chu, W.; Chen, B.; Hsu, N.

Author Affiliation: Tatung University

Abstract: This paper presents a novel economic dispatch strategy for a generation company that owns several units with different fuel costs, efficiency, and locations, and has a bilateral contract with several large customers. The proposed strategy not only considers the generation cost, but also takes into account the wheeling charge for the use of the transmission system. A modified megawatt-mile method is proposed to calculate the wheeling cost in this paper. Finally, the calculation results of economic dispatch for a generation company with two units and their loads in a real power system will be demonstrated.

Power System Security Assessment Using Neural Networks: Feature Selection Using Fisher Discrimination

Jensen, C.; El-Sharkawi, M.; Marks, R.

Author Affiliation: University of Washington, WA

Abstract: One of the most important considerations in applying neural networks to power system security assessment is the proper selection of training features. Modern interconnected power systems often consist of thousands of pieces of equipment, each of which may have an affect on the security of the system. Neural networks have shown great promise for their ability to quickly and accurately predict the system security when trained with data collected from a small subset of system variables.

This paper investigates the use of Fisher's linear discriminant function, coupled with feature selection techniques as a means for selecting neural network training features for power system security assessment. A case study is performed on the IEEE 50-generator system to illustrate the effectiveness of the proposed techniques.

Power System Planning and Implementation

A Comparison Between Chronological and Probabilistic Methods to Estimate Wind Power Capacity Credit

Castro R.; Ferreira, L.

Author Affiliation: Instituto Superior Tecnico (Technical University of Lisbon), Portugal.

Abstract: In this paper, the issue of the capacity credit provided by wind energy conversion systems (WECS) is addressed. A chronological method of post-evaluation of the capacity credit is presented and compared with a pre-evaluation probabilistic method. The proposed chronological approach is based on the computation of the WECS capacity factor (ratio between average and total output) over some relevant time period. An appropriate choice of the time interval—for instance, the peak load hours—will lead to a closer approximation of the capacity credit. The comparison is illustrated with two case studies, concerning the Portuguese electric system. The analysis of the theoretical background of both methods and the results obtained allow the conclusion that chronological methods are best designed to assist system operators, whereas probabilistic methods, which are developed within the logic of the public system avoided resources, are a helping tool for system planners.

Capacity Expansion of Small Isolated Power Systems Using PV and Wind Energy

Billinton, R.; Karki, R.

Author Affiliation: University of Saskatchewan, Canada

Abstract: Renewable energy is being increasingly utilized in electric power systems due to environmental concerns and energy cost escalation associated with the use of conventional energy sources. Photovoltaics and wind energy sources can significantly offset costly fuel in small isolated systems and can also have considerable impact on the system reliability. The utilization of renewable energy in capacity planning requires realistic cost/reliability evaluation models that can recognize the highly erratic nature of these energy sources while maintaining the chronology and interdependence of the random variables inherent in them. This paper presents an evaluation model and applies it to analyze optimum generation expansion of small isolated systems using PV and wind energy sources.

Design of Large Rural Low-Voltage Networks Using Dynamic Programming Optimization

Diaz-Dorado, E.; Miguez, E.; Cidras, J.

Author Affiliation: Universidade De Vigo