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Title

A scheme for controlled islanding to prevent subsequent blackout

Authors

S Shahnawaz Ahmed, NC Sarker, AB Khairuddin, MRBA Ghani, H Ahmad

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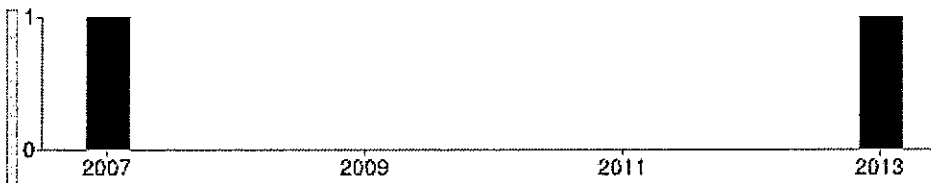
Description

Abstract The power systems operated by the utilities in developing countries suffer from a large gap between demand and generation, inadequate transmission capacity, and nonuniform location of the load centers and generating stations. Occurrences of faults in such systems, in most of the cases, end up with the worst consequences, ie, complete blackout. This paper illustrates the way a blackout can be prevented in real-time through controlled segregation of a system into a number of viable islands together with ...

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Ahmed, S.S. ; Sarker, N.C. ; Khairuddin, A.B. ; Ghani, M.R.B.A. ; Ahmad, H.  
Power Systems, IEEE Transactions on  
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the physical phenomena. By this method, the students enhance their problem-solving abilities with minimal programming skills. By using examples, the paper presents an approach to computer-aided problem-solving methods for junior-level courses. The methods described in the paper have proven to be of value to students studying electric machines and power engineering at Arizona State University.

**Keywords:** Electric circuit, energy conversions, teaching, computer application, MathCad, computer-aided education tools.

**Preprint Order Number:** PE-821PRS (08-2002)

**Discussion Deadline:** January 2003

### **User-Friendly Open-System Software for Teaching Protective Relaying Application and Design Concepts**

Kezunovic, M.

**Author Affiliations:** Texas A&M University, USA.

**Abstract:** This paper describes modeling and simulation software developed specifically for teaching protective relaying application and design concepts. The emphasis was on implementing user-friendly and open-system solutions that will allow an easy use and straight-forward future expansion. This is achieved by introducing new libraries of signal sources and relay elements developed for the Simulink environment of MATLAB. Combined with the Power Block Set (PBS) toolbox of MATLAB, the mentioned libraries allow for a variety of studies aimed at a better understanding of protective relay design approaches and related applications.

**Keywords:** Protective relaying, faults, transients, relaying schemes, time-domain simulation, electromagnetic transient program.

**Preprint Order Number:** PE-634PRS (08-2002)

**Discussion Deadline:** January 2003

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### **Power System Analysis, Computing, and Economics**

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#### **Tuning of Discretization in Bimatrix Game Approach to Power System Market Analysis**

Lee, K.H.; Baldick, R.

**Author Affiliations:** Dankook University, Korea; University of Texas, USA.

**Abstract:** An important aspect of the study of power system markets involves the assessment of strategic behavior of participants for maximizing their profits. In models of imperfect competition of a deregulated system, the key task is to find the Nash equilibrium. The bimatrix approach for finding Nash equilibria is investigated. This approach determines pure and mixed equilibria using the complementary pivot algorithm. The mixed equilibrium in the matrix approach has the equal number of nonzeros property. This property makes it difficult to reproduce a smooth continuous distribution for the mixed equilibrium. This paper proposes an algorithm for adjusting the quantization value of discretization to reconstruct a continuous distribution from a discrete one.

**Keywords:** Game theory, bimatrix game, complementarity problem, mixed equilibrium, payoff matrix, discretization.

**Preprint Order Number:** PE-019PRS (08-2002)

**Discussion Deadline:** January 2003

#### **A Scheme for Controlled Islanding To Prevent Subsequent Blackout**

Shahnawaz Ahmed, S.; Sarker, N.C.; Khairuddin, A.B.; Ghani, M.R.B.A.; Ahmad, H.

**Author Affiliations:** Universiti Teknologi Malaysia; Bangladesh Power Development Board.

**Abstract:** The power systems operated by the utilities in developing countries suffer from a large gap between demand and generation, inadequate transmission capacity, and nonuniform location of the load centers and generating stations. Occurrences of faults in such systems, in most of the cases, end up with the worst consequences, i.e., complete blackout. This paper illustrates the way a blackout can be prevented in real-time through controlled segregation of a system into a number of viable islands together with generation and/or load shedding. The nature and location of any fault that warrants such islanding can be ascertained in real-time through monitoring the active power (MW) flows at both ends of a number of prespecified lines. The blackout of 20 June 1998 in the Bangladesh Power Development Board system is used as an example. The philosophy of the proposed islanding scheme may be considered for implementation in other power systems also.

**Keywords:** Power system security, power system control, power system modeling, power system protection, SCADA system.

**Preprint Order Number:** PE-629PRS (08-2002)

**Discussion Deadline:** January 2003

#### **Application of Actor-Critic Learning Algorithm for Optimal Bidding Problem of a GenCo**

Gajjar, G.R.; Khaparde, S.A.; Nagaraju, P.; Soman, S.A.

**Author Affiliations:** IIT Bombay, India.

**Abstract:** The optimal bidding for generation companies (GenCo) in the deregulated power market is an involved task. The problem is formulated in the framework of the Markov decision process (MDP), a discrete stochastic optimization method. When the time span considered is 24 hours, the temporal difference method becomes attractive for application. The cumulative profit over the span is the objective function to be optimized. The temporal difference technique and actor-critic learning algorithm is employed. An optimal strategy is devised to maximize the profit. A market-clearing system is included in the formulation. Simulation cases of three, seven, and ten participants are considered, and the results obtained are discussed.

**Keywords:** Energy auction, bidding strategies, Markov decision process, actor-critic learning algorithm.

**Preprint Order Number:** PE-076PRS (08-2002)

**Discussion Deadline:** January 2003

#### **Solving the Revenue Reconciliation Problem of Distribution Network Providers Using Long-Term Marginal Prices**

Ponce De Leao, M.T.; Saraiva, J.T.

**Author Affiliations:** Universidade Do Porto, Portugal; INESC Porto, Portugal.

**Abstract:** We describe an integrated methodology to compute long-term marginal prices in distribution networks. Long-term marginal prices are considered the most interesting and economically sound way of allocating network costs to users. Additionally, they inherently deal with the revenue-reconciliation problem, as they generally do not require other large supplementary tariff terms. The proposed methodology uses fuzzy sets to model uncertainties in load forecasts and considers several criteria to guide the identification of solutions. At the end, there is a final decision-making step to select the most adequate expansion plan according to the preferences of the decision-maker.

**Keywords:** Long-term marginal prices, simulated annealing, electricity markets, regulatory policies.

**Preprint Order Number:** PE-097PRS (08-2002)

**Discussion Deadline:** January 2003