EE 416: Deregulated Power Systems (3-0-0:3)

Introduction to restructuring of power industry

Introduction: Deregulation of power industry, Restructuring process, Issues involved in deregulation, Deregulation of various power systems – Fundamentals of Economics: Consumer behavior, Supplier behavior, Market equilibrium, Short and long run costs, Various costs of production – Market models: Market models based on Contractual arrangements, Comparison of various market models, Electricity vis – a – vis other commodities, Market architecture, Case study.

Transmission congestion management

Introduction: Definition of Congestion, reasons for transfer capability limitation, Importance of congestion management, Features of congestion management – Classification of congestion management methods – Calculation of ATC - Non – market methods – Market methods – Nodal pricing – Inter zonal and Intra zonal congestion management – Price area congestion management – Capacity alleviation method.

Locational marginal prices and financial transmission rights

Mathematical preliminaries: -Locational marginal pricing– Lossless DCOPF model for LMP calculation – Loss compensated DCOPF model for LMP calculation – ACOPF model for LMP calculation – Financial Transmission rights – Risk hedging functionality - Simultaneous feasibility test and revenue adequency – FTR issuance process: FTR auction, FTR allocation – Treatment of revenue shortfall – Secondary trading of FTRs – Flow gate rights – FTR and market power - FTR and merchant transmission investment.

Ancillary service management and pricing of transmission network

Introduction of ancillary services – Types of Ancillary services – Classification of Ancillary services – Load generation balancing related services – Voltage control and reactive power support devices – Black start capability service - ancillary service –Co-optimization of energy and reserve services - International comparison - Transmission pricing – Principles – Classification – Role in transmission pricing methods – Marginal transmission pricing paradigm – Composite pricing paradigm – Merits and demerits of different paradigm.

Reforms in indian power sector

Introduction – Framework of Indian power sector – Reform initiatives - Availability based tariff – Electricity act 2003 – Open access issues – Power exchange – Reforms in the near future.

Text Books:

1. Lorrin Philipson, H. Lee Willis, “Understanding Electric Utilities and De-Regulation”, Marcel Dekker Pub
2. Kankar Bhattacharya, Jaap E. Daadler and Math H.J. Boolen, “Operation of restructured power systems”, Kluwer Academic Pub

References:

1. Steven Stoft, “Power system economics: designing markets for electricity”, John Wiley & Sons
2. Mohammad Shahidehpour and Muwaffaq Alomoush, “Restructured electrical power systems: operation, trading and volatility”, Marcel Dekker Pub