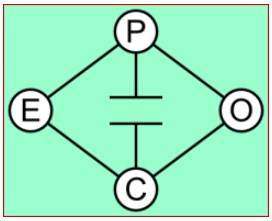

EPOCWW 2010 Book of Abstracts

Probabilistic Wind Forecasting by Quantile Regression

Geoff Pritchard

Abstract

Wind power forecasting in the short term (0–4 hours) is subject to large errors; it is difficult to improve greatly on the simple persistence forecast.

This makes it essential to have a probabilistic forecast, which communicates its own (situation-dependent) uncertainty.

This talk will discuss the use of quantile regression to construct scenario wind power forecasts for New Zealand wind farms.

Modelling Generation Investment Under Uncertainty: UK Experience

James Tipping

Abstract

Investment in deregulated electricity markets around the world is driven primarily by the profit-maximising intentions of market participants. However, their decision-making may not lead to capacity mixes and market operation that are consistent with the goals of policy makers, namely targets for security of supply, environmental standards and diversification of plant portfolios.

Modelling such behaviour requires a tool that is able to mimic the actual investment decision-making process. The tool must account for limited foresight on the part of investors, and interventions on the part of policy-makers. During my time with Redpoint Energy, a London-based energy consultancy, I was part of a team that developed a suite of tools for modelling the dynamic investment decision-making of market participants through time, as plant mixes, policies and pricing dynamics evolve. These tools operate in both the long and short term: investment (and retirement) decisions are made on an annual basis, in response to changes in pricing dynamics and security of supply metrics at an hourly level.

The tools have found frequent application in the Great Britain electricity market, for asset valuation, investment analysis and policy development. They have been used by the UK Government in several studies analysing different financial support mechanisms for renewable electricity, as well as in the analysis of different policies to promote security of electricity supply. In this presentation I will describe the tools at a high level, and detail several of their applications in the context of the British market.

Advances in DOASA

Andy Philpott, Ziming Guan, Vitor de Matos

Abstract

DOASA (Dynamic Outer Approximation Sampling Algorithm) is EPOC's version of SDDP. This talk will outline some of the underlying modelling and algorithmic differences between DOASA and SDDP. These include a discussion of:

(1) single forward pass versus multiple passes;

(2) hot starting techniques;

(3) independent versus Markovian inflows;

(4) convergence analysis;

(5) modeling risk aversion.

We explore the tradeoffs in making these choices by describing some numerical experiments on the New Zealand electricity system.

Energy Storage Management for Upstream/Downstream Reservoir Operators

E. Grant Read

Abstract

Hydro power is often produced from quite complex schemes involving several reservoirs, and some combination of canals, tunnels, and river reaches, connecting one or more catchments. It is often not possible for one entity to optimise operation of the entire interconnected system, though, because river catchments cut across jurisdictional boundaries. And it may not even be desirable, because no one party has unique access to "the truth" about future trends etc. on which to base a global optimisation. Thus it is often necessary, and possibly also desirable, to have different operators managing different reservoirs in the same system. There is a clear problem, though, if downstream managers have no influence over management of their "fuel supply", in the form of potential energy stored upstream. Overseas, a variety of mechanisms have been implemented to manage this problem. Many ultimately require some entity to reconcile differences between participants, and form a single integrated plan. Here we discuss "Energy Storage Management" concepts that are relatively simple to implement, and retains much of the benefit of integrated operation, but allow parties to operate as independently as possible.

An Overview of Current Financial Transmission Rights Markets

Golbon Zakeri and Tony Downward

Abstract

This year the New Zealand Electricity Commission is drafting a proposal for implementing a transmission rights auction for the country. In this talk we will review some current US FTR and TCC markets and outline some efficiency results pertaining to such markets. We do this with a view to possible implications for New Zealand.

Industry and Market Monitoring at the Electricity Authority

Phil Bishop

Abstract

The New Zealand Electricity Commission is to be replaced with the Electricity Authority on 1 November 2010. One of the Authority's functions will be "to undertake industry and market monitoring, and carry out and make publicly available reviews, studies, and inquiries into any matter relating to the electricity industry". An outline of the monitoring work programme envisaged by the Authority will be presented.

An Agent-Based Model of the NZEM: Predicting Prices and Policy Outcomes

David Young

Abstract

I present an agent-based model of the New Zealand Electricity Market (NZEM). Unlike models such as GEM, my model does not assume that firms bid their generators at SRMC. Instead, each firm is controlled by an agent, which is an algorithm that can learn from experience, and whose sole goal is to maximize profit. By running the market repeatedly, the agents learn which strategies make money and which don't. I can then use these agents' bids to predict prices and line flows in the NZEM for given input data (demand, costs, capacities, and network information). This model can thus be used to answer policy questions that cost-based models such as GEM cannot, and in a far more realistic setting than corresponding theoretical models. I use the model to present preliminary results on how prices might change after the forthcoming Tekapo/Whirinaki swap, and which firms might benefit most from the HVDC upgrade in 2012.

Retail Electricity Markets with Risk Aversion and Asset Swapping

Tony Downward, David Young and Golbon Zakeri

Abstract

In this talk we present a model of an electricity retail market where retailers (or gentailers) are risk-averse. Assuming a competitive wholesale market, we investigate how firms' risk-aversion can affect their pricing decisions in the retail market.

We first discuss a single-node example to get an intuition for how firms may behave. We then extend this model to allow for endogenous entry into the retail market. Finally, we present a two-node example inspired by the New Zealand asset swap situation.