
ANTHONY WARE, University of Calgary

Energy market modelling and asset valuation: two industry projects

This talk (presented with Matthew Couch) will give an overview of two projects we have conducted with TransAlta Corp., and we will discuss the challenges and opportunities we have encountered in applying mathematical models to real-world problems.

The first project involved the development of stochastic models for natural gas and power prices in the Pacific North West (PacNW) market, for the purpose of derivative valuation. The PacNW options markets are fairly illiquid, thus the available implied volatility data are limited, and so do not necessarily provide a meaningful measure of price uncertainty. This lack of reliable implied volatility data, combined with the complex nature of power prices, motivates the need for models driven by market fundamentals. In order to capture as much market information as possible while retaining tractability, hybrid pricing models in the style of Coulon, Powell and Sircar (2013) and - more generally - Carmona and Coulon (2014) were chosen. The large impact of hydroelectric generation on the PacNW market required significant revisions to their framework.

The second project was concerned with maximizing the long-term value of hydropower generation in the face of uncertain reservoir inflows, potentially variable constraints on outflows, and possibly wildly varying power prices. We present a stochastic dynamic programming approach to the quantification of reservoir reliability (for example, measures of the risk of over-topping the reservoir or failing to satisfy downstream flow requirements) and a related approach to determining the reservoir flow strategy that maximizes expected revenue, subject to defined target reliability levels