Integrating Real Options Analysis with long-term electricity market models

Daniel Rios, Gerardo Blanco, Fernando Olsina

Abstract

In liberalized electricity markets, the investment postponement option is deemed decisive for understanding the addition of new generating capacity. Basically, it refers to the possibility for investors to postpone projects for a period while waiting for the arrival of new and better information about the market evolution. When such development involves major uncertainties, the generation business becomes riskier, and the investors' "wait-and-see" behavior might limit the timely addition of new power plants. In that sense, the literature provides solid empirical evidence about the occurrence of construction cycles in the deregulated electricity industry. However, the strategic flexibility inherent to the option to defer new power plants has not yet been rigorously incorporated to investment signals in existing market models. Therefore, this paper proposes a novel methodology to assess the long-term development of liberalized power markets based on a more realistic approach for valuing generation investments. The work is based on a stochastic dynamic market model, built upon System Dynamics simulation approach. The decision-making framework considers that the addition of new capacity is driven by the economic value of the strategic flexibility associated with deferring investments under uncertainties. Thus, the value of the postponement option is quantified in monetary terms through Real Options Analysis. Simulations confirm the cyclical behavior of the energy-only market in the long run, as suggested by the empirical evidence found in the literature. In addition, sensitivity analysis regarding some relevant exogenous variables depicts an even more fluctuating evolution of the capacity due to the combination of strong demand growth rates with large volatilities. Finally, the model validity is assessed through a formal procedure according to the scope of System Dynamics modeling approach.