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A dynamic real option-based investment model for renewable energy portfolios

A. Campos Passos, A. Street, L.A. Barroso

Abstract— This work proposes a dynamic model to devise the optimal risk-averse investment policy in a portfolio of complementary renewable sources for a generation company in the Brazilian power system. The proposed method merges a static energy-contracting model, based on a hybrid robustand- stochastic optimization approach, with a mean reverting binomial lattice model for real-option valuation. The proposed merge extends previous works by providing support to riskaverse investment decisions in complementary renewable sources dynamically distributed over time. The most important results of the model are: how much capacity to invest or build from each renewable source, how much to sell from the energy portfolio in bilateral contracts, and the optimal timing to invest. Unlike previous reported works, our model takes into account three classes of uncertainties simultaneously: renewable production of candidate sources and prices in the spot and contract markets. A case study with realistic data from the Brazilian power system is presented to illustrate the value of our model.

Index Terms— Binomial lattice, complementary renewable sources, investment timing, real options, renewable energy portfolio, risk-averse dynamic investment decisions, robust and stochastic optimization.

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