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Mathematical challenges of the energy markets

The complexity of the instruments traded in the energy markets, together with the extreme volatility of electricity prices offer challenging problems to the mathematicians. We shall review some of the practical issues with the gas and power markets (spark spread options and plant valuation, gas storage, weather derivatives, swing options), and we shall formulate the corresponding mathematical problems. After discussing the mathematics involved in the existing solutions, we will concentrate on options with multiple American exercises, and we will present new mathematical results for the pricing of these options.