Enabling Active/Passive Electricity Trading in Dual-Price Balancing Markets

In electricity markets with a dual-pricing scheme for balancing energy, controllable production units typically participate in the balancing market as "active" actors by offering regulating energy to the system, while renewable stochastic units are treated as "passive" participants that create imbalances and are subject to less competitive prices. Against this background, we propose an innovative market framework whereby the participant in the balancing market is allowed to act as an active agent (i.e., a provider of regulating energy) in some trading intervals and as a passive agent (i.e., a user of regulating energy) in some others. To illustrate and evaluate the proposed market framework, we consider the case of a virtual power plant (VPP) that trades in a two-settlement electricity market composed of a day-ahead and a dual-price balancing market. We formulate the optimal market offering problem of the VPP as a three-stage stochastic program, where uncertainty is in the day-ahead electricity prices, balancing prices, and the power output from the renewable units. Computational experiments show that the VPP expected revenues can increase substantially compared to an active-only or passive-only participation, and we discuss how the variability of the stochastic sources affects the balancing market participation choice.