

A Forward Energy Market for a Reliable Grid

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Abstract

Electricity markets use the real-time energy price to balance supply and demand. Frequent shocks to supply and demand imply that the real-time price must vary from -\$100 to \$9000 per megawatt-hour, although the price is often about \$30. Market participants trade forward products to manage risk from the high price volatility in the real-time market. For example, demanders typically buy ahead a quantity roughly equal to their real-time consumption, and suppliers sell forward an amount about equal to their real-time production. This paper describes how the system operator can facilitate forward trading with a forward energy market. The products are financial derivatives of the day-ahead energy product. (The day-ahead market already manages risk between day-ahead and real-time products.) Monthly forward energy is traded up to $12 \times 4 = 48$ months ahead for every type of day (weekday, weekend) and hour. Hourly forward energy is traded up to $24 \times 7 = 168$ hours ahead. These monthly and hourly products enable both sides of the market to establish forward positions consistent with their needs to manage risk better. Trade occurs without frictions with hourly clearing using the Budish-Cramton-Lee-Kyle-Malec flow trading methodology. Flow trading allows participants to adjust positions simply and efficiently over time as information changes. The approach identifies unique prices and quantities for the products that maximizes as-bid social welfare. The system operator performs the settlement and manages collateral requirements. There is transparency about price, quantity, and forward positions. The market can be voluntary in energy-only markets. Alternatively, the forward energy market can be mandatory—replacing the capacity market—with an increasing schedule of obligations as we get closer to real time. The advantage of the forward energy market is it gives participants great flexibility in adjusting positions consistent with needs.

Introduction

[The full text will be available in August 2021.]

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