

## Electricity generation and sale in open electricity markets in the US

In an open electricity market in the US, an Independent System Operator (ISO) is responsible for coordinating and controlling the electricity grid.<sup>1</sup> Entities that wish to sell power into the grid submit a series of bids to the ISO, each bid indicating exactly where and when on the grid they propose to sell electricity and specifying their minimum price. The ISO will match supply with demand and accept all bids up to a certain market clearing price.<sup>2</sup> Bids at or below the market clearing price are accepted, which means they are paid out at the full market clearing price and the seller must produce the promised electricity. Bids above the market clearing price are discarded.

In this market, three of Porter's five forces hold little strength. First, the threat of substitutes is very low, as it would be difficult and impractical for a consumer of grid electricity to switch to say, running their own gas generator. Second, the power of suppliers is limited as different generators of electricity use different technologies with different suppliers. Third, buyers in this market hold essentially no power. This is because the ISO sets the market clearing price, so even if buying power is grouped together in a single monopolistic power retailer (e.g., PG&E in Northern California), they hold little power over the price they pay.

Rivalry between existing firms in the electricity generation space is fierce. In the primary electricity market, generators sell an undifferentiated product (electrons on a wire) that for some generators cannot be stored, creating a use-it-or-lose-it situation. The result is generating companies invest heavily into process and cost optimization, as in the short term it is often the only way to increase profits.

The threat of new entrants into the market is significant. New entrants threaten existing companies primarily by employing a new technology to lower production costs. For example, a

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<sup>1</sup> [https://en.wikipedia.org/wiki/Regional\\_transmission\\_organization\\_\(North\\_America\)](https://en.wikipedia.org/wiki/Regional_transmission_organization_(North_America))

<sup>2</sup> <https://www.iso-ne.com/about/what-we-do/in-depth/how-resources-are-selected-and-prices-are-set>

new entrant may assemble a solar array where they see both 1) favorable environmental conditions (i.e., lots of sun) and 2) a high market clearing price on the grid. That new solar array, while requiring a large, fixed investment to construct, enjoys nearly zero marginal cost for electricity generation and cannot on its own store power, and thus submits generation bids to the ISO of exceedingly low prices. Traditional fuel-based generators can't directly compete with these prices, and thus must adjust their strategy and tactics accordingly (e.g., produce and sell electricity when the sun isn't shining.)

Overall, the electricity generation market is profitable only if a seller has established a geographic or technological advantage. The market is changing rapidly, with new entrants bringing more wind and solar power online, delivering electricity at exceedingly low marginal cost but failing to match demand in time and space. Moving forward, we can expect rivalry and the threat of new entrants to keep profitability in this industry low.