# **operating reserve demand curve, scarcity pricing and intermittent generation: Lessons from the texas ercot experience**

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#### Overview

After the liberalization of the energy sector, many regional electricity markets faced the so-called resource adequacy problem or “missing-money” problem. In other words, liberalized and competitive electricity markets were not providing the right incentives to build adequate capacity to guarantee (long-term) supply reliability.

To solve the resource adequacy problem, many countries and regions implemented capacity markets (for instance, the ISO-New England, the Pennsylvania-New Jersey-Maryland Interconnection, the New York ISO, etc.). Through such markets, electricity generators compete for funds to build new generation capacity. However, there are some other markets in which regulators are skeptical about the potential benefits of capacity markets.

This is the case in the Texas ERCOT market (one of the few “energy-only” markets that are currently operating). In this market, the regulators implemented in June 2014 an alternative mechanism to provide adequate incentives though an improved scarcity pricing system: the Operating Reserve Demand Curve (ORDC) system. The basic idea underlying this mechanism is that generators holding additional reserves are compensated whenever reserves cross a lower threshold. The compensation is immediately added to the wholesale price.

In the present research project, we evaluate the advantages and disadvantages of the ORDC system based on the experience of the Texas ERCOT market over the past two years. We pay special attention to the impact of the growing penetration of intermittent renewable generation in the grid.

Our conclusions apply not only to the Texas ERCOT market, but also to the Mexican market (which implemented an ORDC system in the 2016 market reform) and to the few “energy-only” markets in Europe that are looking for alternatives to capacity markets in order to enhance reliability.

#### Methods

We setup a stylized theoretical model, with the marginal generator solving for the profit-maximizing outcome against the residual demand. We consider two scenarios. In the first scenario, there is power generation coming from a variable renewable source (e.g. wind). In the second scenario, there is no variable renewable generation. Then we test some theoretical predictions using data from the Texas ERCOT market. We employ data on real-time prices, price adders (from the ORDC), load, weather conditions and wind generation.

#### Results

We find two main results. First, using our theoretical model, we question the effectiveness of the ORDC system to improve scarcity pricing. Second, based on our empirical results, we find that wind generation suppress not only real-time prices, but also ORDC price-adders. Therefore, we expect that as wind generation growths, the ORDC system will become less effective to improve scarcity pricing. Such problem is not observed, for instance, in capacity markets.

#### Conclusions

Is it possible to solve the “missing-money” problem in a competitive electricity market with price caps? The Texas ERCOT market and, more recently, the Mexican electricity market are trying to do so through the ORDC system. In the presence of this system, generators holding reserves are compensated, providing an additional incentive to increase investment in generation capacity. In this research project we check theoretically and empirically the effectiveness of the ORDC system as a mechanism to improve scarcity pricing and to solve the “missing-money” problem. Our conclusions can inspire future policy measures not only in Texas and Mexico, but also in some of the European countries that still operate “energy-only” electricity markets with price caps.

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