

ENERGY REGULATION BRIEF

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**DEMAND
RESPONSE
MEASURES:
USING MARKET
FORCES TO FIX
ELECTRICITY
MARKET
FAILURES****DR. MICHAEL ROSENZWEIG**
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The Federal Energy Regulatory Commission (FERC) issued its Standard Market Design Notice of Proposed Rulemaking (SMD NOPR) in an effort to create a standard set of arrangements for US power markets. However, FERC is very sensitive to the price volatility that occurred in those US markets that restructured early, which FERC largely blames on the lack of price responsive demand. FERC's response was to incorporate into its design a burdensome administrative structure to ensure that suppliers cannot manipulate the market. This focus on the supply side ignores how markets actually work and, by discouraging investment in the long run, is likely to be self-defeating. A more direct approach would be to enable enough demand-side price-responsiveness to discipline suppliers. This price elasticity could be obtained by exposing the largest users to some measure of real-time pricing whenever the market is supply-constrained. This is a practical approach since the economics of manipulating power markets depends upon both sufficiently tight supply conditions and inelastic demand. We now know from real-world experience that a relatively small amount of price-sensitive demand can remove the necessary preconditions for price manipulation and make markets work better.

Background

FERC has characterized the SMD NOPR as the third in a series of initiatives undertaken to harness the benefits of competitive markets for US electric energy customers. Its ultimate goal is structurally competitive, efficient markets, immune to price manipulation by participants. The SMD NOPR effort to standardize market arrangements for US power markets is a laudable objective. The multiplicity of idiosyncratic approaches adopted in the early mover jurisdictions (California, New England, the Mid-Atlantic, and the Midwest) helped produce today's tumultuous and tenuous state of market development in the US.

The NOPR specifically reflects a heightened sensitivity to the poor experience in California, one of the notable "failures" of early restructuring efforts in the US and now the favourite example of the anti-reform movement. This sensitivity is reflected in the NOPR's special emphasis on market mitigation and monitoring. FERC's focus is understandable in light of the California experience and the consequent need to reassure key stakeholders that, if power markets cannot or do not discipline themselves, non-market mechanisms will provide the necessary protection for consumers. However, FERC currently envisions mitigation measures aimed at controlling manipulation of the supply of generation in markets that are typically workably competitive.¹ In focusing solely on artificially constraining behavior on the supply side, FERC ignores mechanisms to create demand responsiveness. Of equal concern, as FERC itself notes, the supply-side measures risk interfering with the normal corrective market process for tight supply, which is the investment in additional capacity.²

Price spikes occur when suppliers can manipulate price because reserves are scarce and customers cannot respond to price increases by reducing their consumption. When these spikes are unconstrained, as they could be in the short-term in the absence of demand response, they result in uneconomic wealth transfers.

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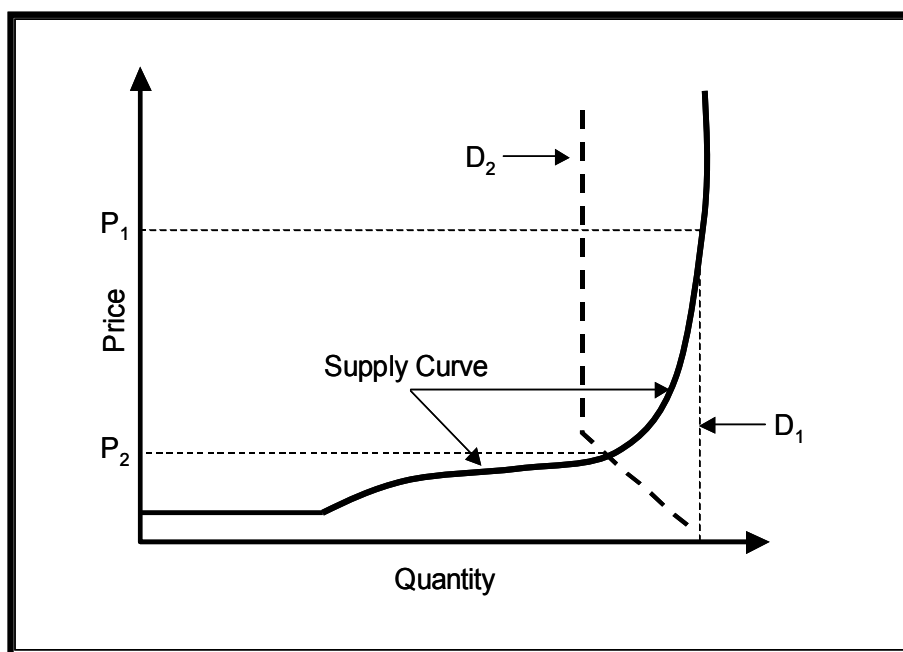
¹ In regional markets not characterized by an infrastructure and institutions that support workable competition, FERC has stated that preventive mitigation must be more stringent, including cost of service tariffs and the denial of market-based rate authority, and more intense scrutiny of mergers.

² See A.E. Kahn in the February 2002 issue of the ERB for a discussion of this problem.

FERC's first line of defense against these spikes (outside of load pocket situations³) is a bid cap, followed by a voluntary Automatic Mitigation Procedure to respond to potential abuses of market power.⁴ However, FERC recognizes that "spot market prices that are subject to mitigation measures may not produce an adequate level of investment"⁵ in the long-term, and to deal with this deficiency, FERC imposes a capacity obligation on customers, called the Resource Adequacy Requirement (RAR). The RAR is intended to overcome an expected lack of incremental investment to meet generation requirements caused in large part by other mitigation measures that threaten to harm revenue recovery.⁶

In contrast, FERC could address the real problem of potential market failure – the inability of the demand-side of the market to respond to price – more directly through a demand-side solution, which we will term a Demand Response Mechanism (DRM). Such a DRM, which would operate under the purview of the system operator (the so-called Independent Transmission Provider in the nomenclature of the NOPR), would provide customers a way to react to high prices without discouraging the corrective investment in additional capacity. The straightforward economics of the DRM are shown in the following diagram:

Figure 1
The Economics of DRM



The solid line is the supply curve of offers from generators. D1 is the typical demand curve (without any special measures to promote price response) that causes prices to reach P1. D2 is the demand curve after the DRM is in effect. The added demand responsiveness in D2, represented by the sloping portion of the dashed line, causes clearing prices to drop from P1 to P2.

A Market Solution: A Demand Response Mechanism

An efficiently designed DRM would control prices by enhancing demand elasticity through a mechanism that would, in a supply-constrained market, expose the largest users to some measure of real-time pricing. Such a DRM could have the following design characteristics:

³ For these uncompetitive situations, FERC proposes mandatory contracts.

⁴ An Automatic Mitigation Procedure is an administrative intervention in a market to correct perceived market power problems. It functions automatically, typically by adjusting bid prices from offending suppliers.

⁵ SMD NOPR paragraph 467.

⁶ Kahn, *supra*.

- DRM would apply to a minimum number of the largest consumers.
- DRM would only be triggered under predetermined conditions of supply scarcity.
- DRM participants would be made financially whole for a “baseline” quantity of energy through a contract for differences (CfD).
- Consumption in excess of the baseline would be charged market prices.
- Customers could offer to consume less than their baseline amount, in which case they would “sell back” the difference at market prices.

The Mechanism

Conceptually, an effective DRM could be created as follows:

Set up a demand response pool

The underlying relationship between the volatility of the market price and the supply / demand margin implies that there is a quantity of demand response that will dampen upward price pressure by enough to counter any withholding of generation capacity. The few examples that have been observed indicate that when supply is scarce relative to demand, a reduction in demand of 2-5% could reduce prices by half or more.

A set of the largest customers with enough demand to provide the required quantum of demand response would be the “participants” in the DRM. Choosing the largest consumers as participants would minimize the number of participants, lowering implementation costs and simplifying operational management and settlement. The number of participants only needs to be large enough to ensure that a sufficient market-based response is feasible. The size of the pool is a parameter that needs to reflect the idiosyncratic nature of a market, e.g., the size and spatial distribution of customers, but one possibility could be the normal operating standard, say a spinning reserve requirement of seven percent of load.

The trigger

A “trigger” would be defined in a way that reflected the values of decision parameters used by system operators to trigger other acts intended to remedy a tight supply situation. For example, suppose the system operator takes special measures or invokes special rules when unable to maintain the required level of operating reserves; a similar condition would authorize the system operator to call upon the DRM.

The application of the DRM

When the trigger condition is met, the system operator would notify the selected participants that the DRM is in effect. The system operator would communicate the baseline energy quantities to participants. The CfDs with customers would also become effective. Each participant would pay a “fee” to the system operator for the quantity of electricity attributed to meeting its load in the day-ahead market. This fee would be the difference (if any) between the day-ahead market price and the tariff or contract price that the participant faces for its consumption. For load equal to the baseline, the CfD would precisely offset the fee. For load above the baseline, there would be no CfD coverage and the participant would pay the market-clearing price for the additional consumption, which exacerbates the tight supply condition. Finally, if the participant lowered its consumption below the baseline, it would keep the CfD payment and would receive the market-clearing price for the reduction in consumption, which helps relieve the stress on the system.

A bidding process

Conceptually, demand bidding is not necessary to achieve an appropriate demand side response. But this mechanism also can be a minimum-cost tool for the system operator to balance supply and demand in a situation where supply shortfall would otherwise produce a draconian outcome of forced load shedding. However, the operator must know how much demand response to expect for this tool to be useful. A bidding process is an efficient way to obtain the needed information. Moreover, with a bidding scheme, the operator can reflect economic demand response in the day-ahead market-clearing price. This is precisely the DRM mechanics for controlling price spikes. Finally, if the operator believes that the demand response is credible, it may be able to avoid more costly actions to remedy a tight supply condition.⁷

Settlement

Each system operator will need to design a settlement process to reconcile the transactions among the various parties, including the fee and CfD payments. For example, the settlement process could be the same as in non-DRM periods except that the relevant Load Serving Entity (LSE) would act simply as a conduit for the net exchange of funds between the system operator and the DRM customer.

Conclusion

The FERC Standard Market Design displays surprisingly little confidence in the market forces at the core of its power sector reform. Though it acknowledges demand side inelasticity as a primary culprit in observed market failures, the SMD addresses these failures by resorting to a clumsy, non-market administrative edifice. FERC appears to give up too easily on the demand-side. A DRM could harness market forces that will protect customers in the short term while supporting FERC's own goal of developing structurally competitive markets by allowing suppliers to earn adequate (but efficient) returns on investment.

⁷ If the system operator thought it needed more certainty than the promises of economic theory, penalties could be imposed for failure to abide by an accepted offer to consume less than the baseline. However, such an approach may simply discourage some participants from bidding to avoid the risk of a penalty. Similarly, direct load control would provide complete certainty of demand response but has its own problems, particularly with participant acceptance.

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