Conduct and Impact vs. State of the Market Triggers for Automatic Market Mitigation

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Why Mitigate

Market mitigation procedure are aimed at rectifying market imperfections that may prevent market forces from achieving desired social objectives and at containing the potential adverse economic impact of such imperfections. In most markets for commodities, goods and services, mitigation is limited to structural solutions within the framework of the antitrust laws that focus primarily on persistent market power and barriers to entry. However, the unique characteristics of power systems make electricity markets extremely vulnerable to temporal and locational market dysfunction with potentially severe economic and reliability consequences which necessitate proactive and timely intervention in addition to long term structural remedies. Such measure can be rationalized from both an economic and an engineering perspective.

From an economic point of view electricity markets have inherent structural flaws that prevent competitive forces present in ideal commodity markets from achieving the desired social objectives. Hence market power mitigation measures are needed to compensate for these structural flaws. From an engineering perspective electricity markets represent decentralized/distributed control mechanisms integrated into the traditional command and control power systems operations. Hence, market mitigation can be rationalized as corrective actions based on security states of the markets, akin to the traditional corrective measures of system operations protocols based on system security states.

The Economic perspective:

The economic rationale for market mitigation procedures has been well articulated in the FERC SMD NOPR (http://www.ferc.gov/industries/electric/indus-act/smd/nopr.asp) which states that: "The development of structurally competitive markets is the Commission's long-term goal. However, at this stage of the industry's evolution, wholesale electric markets are not yet structurally competitive in all respects." In particular FERC has identified two significant structural flaws standing in the way of a functionally competitive wholesale electricity industry: the lack of price-responsive demand and generation concentration in transmission-constrained load pockets. FERC also noted that "even in regions where markets are generally competitive, transmission constraints may create non-competitive conditions during certain hours. " It, therefore, concluded that "given these structural defects, the Commission cannot rely on the interaction of supply and demand in all instances to ensure that prices are competitive and thus just and reasonable."

In view of these observation FERC recognized that "When markets do not produce competitive outcomes, the Commission must use new regulatory tools to produce just and reasonable results." Specifically they propose "new market power mitigation measures to deal with the consequences of major structural defects in wholesale electric markets, by approximating the outcomes that a competitive market would produce." "Market mechanisms can be used to approximate the outcomes that a competitive market would produce to provide the price signals for efficient investment and demand response."

The immediate consequence of market imperfection due to the inherent structural flaws discussed above is market power. According to the FERC SMD NOPR: "Market power is the ability to raise price above the competitive level. This can be accomplished if the generator can withhold physical power (physical withholding) or cause physical power to be withheld through inflated bids (economic withholding)." "Market power can also be exercised by creating barriers to entry so other suppliers cannot reach the market or by causing other supplier's production costs to increase." However, regardless of how it manifests itself and the cause "Market power mitigation needs to mitigate local market power, whether it arises because of a load pocket, transmission constraints, or ownership concentration." "To be effective, market power mitigation measures must be applied before the fact, since remedies after the withholding has occurred are disruptive to the market and increase regulatory risk to its participants, which increases costs to customers."

The Engineering Perspective

Power system operations protocols recognize the following six security states identified by DyLiacco [1968]**:**

- *Normal and Secure State***:** All load supplied, no operating limits violated, and in the event of a single contingency, there will be no violations or transition from the normal state.
- *Normal Correctively Secure State*: All load supplied; no operating limits violated; any violations caused by a contingency can be corrected by appropriate post-contingency control actions without loss of load.
- *Alert Insecure State*: loads are met; no operating limits violated; some violations caused by a contingency cannot be resolved without loss of load.
- *Correctable Emergency State*: All load supplied; some operating limits are violated that can be corrected by appropriate control actions without loss of load.
- *Non-Correctable Emergency State*: all load supplied; operating limits are violated; but cannot be corrected without loss of load.
- *Restorative State*: No operating limits are violated, but loss of load has occurred.

An analogous classification can be developed for states of the market as follows:

(The following classification is based on joint work with A Paplexopolous, H-P Chao, D. Sobajic and R. Wilson sponsored by EPRI)

- *Normal & efficient*: Supply offers are greater or equal to demand; Market clears economically without violating physical operating limits; No spikes in prices for energy, A/S, and congestion charges; Market results are posted within market time-lines.
- *Normal Correctively efficient*: Supply offers are greater or equal to demand, Market clears with some appropriate market corrective control actions (uneconomic adjustment, AMP, Residual Unit Commitment, or simply etc.); No spikes in prices for energy, A/S, and congestion charges; Market results are posted within market time-lines.
- *Alert Inefficient*: Supply offers are greater or equal to demand; Market clears with some appropriate market corrective control actions; Spikes in prices for either energy, reserves, or congestion.
- *Correctable Emergency*: Supply offers are insufficient to meet demand; Bids are at very high levels; Under-scheduling of load in DA market; Market clears; Administrative rules are used to clear the market or market results are not posted within market time-lines.
- *Non-Correctable Emergency*: Supply offers are insufficient to meet demand; Bids are at very high prices; Abuses of market power that can NOT be corrected or detected in time; Excessive real-time deviation from DA schedules; Excessive costs incurred to make corrective actions; Frequent violations
- *Market Collapse*: Suspend market; Encourage long terms contracts to reduce the excessive real time deviations; Give right incentives to market participant to add physical resources which will make market more competitive; Market rules re-design

Within this framework, market mitigation measures can be interpreted as corrective measures that are invoked based on the state of the market with the objective of restoring the market to its "Normal and Efficient" state were unmitigated market forces are allowed to prevail.

Market Mitigation Approaches

Market mitigation approaches can be categorized as follows:

Structural and Preventative Remedies

Long Term measures

Forced divestiture or mandatory capacity auctions

Entry and new investment

Facilitate demand response

RMR contracts and bid caps on specific generators

Limits on CRR ownership

Short term measures

Exclusion of noncompetitive constraints from LMP calculation

Exclusion of generators with local market power from setting prices

Approaches:

Market Intervention

Long Term

Reserves or hedging requirement

Mandatory vesting contracts

Offer caps (generator specific and global safety-net caps)

Short term

Direct monitoring of market behavior

Automatic market mitigation

- Setting locational offer caps based on economic dispatch excluding non-competitive constraints (ZEN)
- Directed mitigation based on conduct and impact test applied to individual entities (e.g. NY AMP)
- General mitigation activated by market condition test (e.g. CSM and MCSM at ERCOT)

The FERC SMD NOPR leans toward directed mitigation based on the judgment of a market monitor and on a conduct and impact tests, in addition to a safety-net bid cap and a resource adequacy requirement. Specifically FERC proposed that: "The market monitor will identify certain conditions in which certain generators are in concentrated geographic markets created by transmission congestion or reliability needs of the grid. These would include units needed to run to support the reliable operation of the grid or a set of units owned by a small number of companies. At those times, those units will have localized market power so that when they are required to provide their energy or ancillary services to the grid their bids into the market should be capped." In addition FERC endorses the NY style AMP approach of "Examining and possibly limiting bids from individual suppliers into the day-ahead and real-time spot markets if those bids are high due to withholding rather than scarcity. Exercise of this mitigation could be triggered by predetermined conditions or triggers (such as a sustained period of prices significantly above competitive levels), or by significant infrastructure problems in the market (e.g., sustained tight reserve conditions, as might be due to drought)."

By contrast the Market Oversight Division (MOD) of the Public Utility Commission of Texas (PUCT) has advocated general mitigation (applied across the board) activated by market condition triggers. The first mitigation protocol of this type has been adopted by the PUCT in response to the devastating economic impact resulting from "Hockey Stick" bidding during the February 2003 ice storms. Over a three day period the clearing price for balancing energy in ERCOT was set for most of the hours to $990/MWH by a single MWH offered consistently at that price. The high price resulted from the system emergency condition during the ice storm and the fact that ERCOT protocols require that it procures all of the offered balancing energy and set the clearing price at the highest offer price before deploying any reserve energy. As a result of these high prices, one of the retail energy providers (TCE) went into bankruptcy.

The market mitigation approach adopted by the PUCT known as the Modified Competitive Solution Method (MCSM) is currently applied only when the balancing offer stack for the entire ERCOT control area is fully exhausted. Under these circumstances balancing clearing prices are capped at the level of the highest offer in the bottom 95% of the offer stack plus a 50% scarcity rent proxy. Offers above that level are paid as bid but do not set the clearing price. MOD is currently seeking to expand this procedure, as originally proposed, to situations where the offered balancing stack is “too short” or when pivotal offers by single entities (which if withdrawn will result in a shortage) are present. The proposed method will remove from the offer stack pivotal offers amounting to more than 5% of the supply and set a general offer cap at the highest offer price in the lowest 95% of the remaining stack (after removal of pivotal offers) plus a 50% scarcity rent proxy.

Conclusions

- Market power mitigation is a necessary evil that is required in order to achieve market credibility and stability
- Structural remedies may not be sufficiently responsive to temporary market failure conditions that may have devastating impact over short time periods
- Market intervention must strike a fine balance between suppressing scarcity rents that are needed to stimulate investment and entry and preventing price gauging
- Market mitigation must be addressed in conjunctions with mechanisms that will allow prices to reflect legitimate scarcity rents and with mechanisms for generation adequacy assurance