

Review of PJM’s Market Power Mitigation Practices in Comparison to Other Organized Electricity Markets

**The Brattle Group
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Executive Summary

The Brattle Group was commissioned by PJM to study how market power and market power abuse should be defined in the context of electricity market power mitigation, to examine the market power mitigation practices used in PJM and other organized electricity markets in the United States and internationally, to assess the extent to which “best practices” have developed with respect to market power mitigation in electric power markets, and if appropriate, offer recommendations as to possible changes in PJM’s current practices.

The report reviews antitrust and academic literature as well as the mitigation approaches used in organized power markets to develop an appropriate definition of “market power” and “market power abuse.” The report recommends that market power be defined, consistent with the definition used by antitrust agencies, as “*the ability of an individual supplier or group of suppliers to profitably maintain prices above competitive levels for a significant period of time.*” However, due to the unique nature of electric power, a “significant period of time” may be as short as several dispatch periods in the presence of price spikes.

The definition of market power abuse (*i.e.*, the excessive or unreasonable exercise of market power) is much more difficult to articulate. The report notes that the mere *possession* of market power is not uncommon or illegal in itself. In fact, it is common in many markets, including power markets, for sellers to have a modest amount of market power (*i.e.*, some ability to raise price). Policymakers, recognizing this fact, have created the notion of “workable” competition as a more realistic goal than that provided by the theoretical concept of “perfect competition.” Under workable competition, price may exceed marginal cost to some extent and firms may engage in limited exercises of market power. Based on this concept of workable competition, the abuse of market power means exercising market power beyond a level determined by public authorities to be the limit of “just and reasonable” pricing and proper market operations.

In general, organized U.S. wholesale electricity markets do not typically define the term abuse of market power. Instead, they tend to identify either structural conditions conducive to the exercise of market power, or specific market conduct and practices (*e.g.*, economic or physical output withholding) that must be mitigated. The report recommends that market power abuse be defined at least qualitatively as “*any conduct that ultimately harms consumers by substantially distorting or impairing competition, and that would not be in the economic interest of the market participants but for the presence of market power.*” It is also recommended that PJM work with FERC to clarify what should be deemed a substantial deviation from a fully competitive outcome based on the just-and-reasonable pricing standard.

The report finds that, although the RTOs in the U.S. have similar market structures, they have chosen two substantially different approaches in how they mitigate prospective market power through the implementation of *ex ante* restrictions. PJM's market power mitigation process and the new market designs of CAISO and ERCOT rely primarily on *structural tests* (e.g., the three jointly pivotal supplier test) which prevent firms that appear to have market power from abusing this apparent power. Other RTOs—MISO, NYISO, and ISO-NE—rely on *conduct-and-impact tests* that determine whether a firm has likely exercised market power and whether this exercise of market power had a material impact on prices. The structural approach in practice tends to be more restrictive in that it assumes that a supplier with the ability to exercise market power also has the incentive to do so, whereas the conduct-and-impact approach triggers mitigation only if there is actual evidence that market power has been exercised in a manner that affects market prices.

While clear “best practices” have not yet evolved, the report lays out a best practices mitigation framework, identifies a number of best practices guidelines, and addresses PJM's implementation of its three jointly pivotal supplier test from a best practices perspective. For example, with respect to structural and conduct-and-impact approaches, the report suggests that they necessarily should not be viewed as substitutes for one another. Rather, they are naturally complementary. Purely structural screens can benefit from an added conduct-and-impact assessment that avoids mitigation actions if individual participant behavior does not suggest that significant market power is being exercised. Similarly, a conduct-and-impact screen can benefit from the inclusion of an additional structural screen that can identify market conditions or geographic regions where significant market power concerns may exist.

Based on a review of the strengths and weaknesses of both approaches, the report finds that a more integrated structure, conduct, and performance framework is advisable for triggering market power mitigation measures. A sole structural test, such as a pivotal supplier test, could be improved by taking advantage of a market monitor's ability to assess individual firm conduct and its impact on actual market performance, so that mitigation errors are reduced. Arguably, RTOs have information on prior participant behavior, as well as reasonably refined cost information, that allow them to assess whether an apparent abuse of market power is taking place. Applying an integrated approach using both conduct-and-impact evaluations and structural screens also allows the RTO to engage more easily in self-assessments of the effectiveness of the market-monitoring process. For example, if the conduct-and-impact screen finds many instances where there is no significant exercise of market power occurring when a particular structural screen indicates cause for concern, then the RTO may choose to consider alternative structural screens that are less strict. Similarly, by examining the structural conditions under which market power mitigation is arising under a conduct-and-impact approach, the RTO can develop “early warning” structural screens to identify conditions that raise cause for concern. This will increase the effectiveness of mitigation and reduce the costs imposed by the mitigation process.

The recommended best practices framework for developing mitigation processes involves a three step approach in which: (i) market power abuse is defined clearly; (ii) a transparent screening framework to detect likely abuses of market power is

developed that explicitly considers the aggregate social cost of testing errors, both in terms of costs associated with “false negatives” (*i.e.*, failing to mitigate when market power abuse exists) and “false positives” (*i.e.*, imposing mitigation when market power abuse does not exist); and (iii) mitigation actions are specified based on competitive “reference levels” that take into account the reliability with which such levels can be determined.

While it is well recognized that consumer harm resulting from inadvertently unmitigated market power abuse can be extensive, the long-term cost of over-mitigation must not be underestimated. Mitigation actions, if they are erroneous or unnecessary, can promote both short-term and long-term inefficiency. This can lead to costly changes in the operations of generating plants and distorted prices that adversely affect investment incentives, contracting behavior, demand response, innovation, and dynamic (*i.e.*, long-run) efficiency. Even if over-mitigation does not have significant short-term price impacts, it may create a perception of having the potential for such price impacts, which may undermine the confidence of those investing in new generation and result in higher long-term costs for consumers.

The screening tools used in *ex ante* mitigation processes also need to be evaluated periodically to identify adjustments and modifications that could improve the reliability and effectiveness of the applied screens. Careful *ex post* monitoring of market performance will be necessary to evaluate unusual market events and identify abuses of market power and inappropriate conduct that may elude *ex ante* mitigation processes. If such abuses of market power or inappropriate conduct are detected on an *ex post* basis with increasing frequency, both the market design and *ex ante* mitigation processes can be adjusted accordingly. The *ex post* assessment of *ex ante* mitigation processes also needs to focus on whether those processes appropriately allow for a transition to workably competitive electricity markets. Stringent *ex ante* mitigation processes increase the prospect of continually price-regulated markets, thereby preventing competitive outcomes even where workable competition might otherwise exist.

It also is important that market-clearing prices reflect the bids (or mitigated bids) of *all* dispatched supply and demand-side resources. With respect to imposed mitigation actions, where possible and reliable, reference levels for market participants’ bids or the associated market prices should be reflective of bids and market prices during competitive conditions. To the extent that marginal-cost-based reference levels are used, they should reflect true marginal costs, including full opportunity costs, and the potentially difficult-to-quantify operating costs of certain resources such as combustion turbines. Adders to marginal costs (or to marginal-cost-based market-clearing prices) should reflect: (i) the likely magnitude of estimation errors (which may be larger for resources with difficult to quantify marginal costs); and, (ii) the scarcity of available supply or demand-side resources (depending in part on the design of capacity markets). However, while several RTOs have addressed scarcity pricing, more effort is needed to accurately quantify and implement scarcity pricing provisions that appropriately address supply and demand-side resource balances, including the value of ISO-controlled or utility-dispatched demand response resources.

While the report does not recommend that PJM abandon the use of the three jointly pivotal supplier test entirely, it does question whether this test represents a best practice

structural test. The following concerns are highlighted. First, the theoretical and empirical academic research evaluating the performance of the three jointly pivotal supplier test is quite limited. Second, it is a potentially stringent test that may be susceptible to triggering over-mitigation (*i.e.*, imposing mitigation when market power abuse does not exist). Third, critical implementation details of how PJM's test is applied in the real-time and day-ahead markets are not sufficiently transparent to allow market participants to gain a thorough understanding of the test and resulting mitigation actions. Fourth, because of its implementation on a constraint-by-constraint basis, the test likely does not correctly identify relevant geographic markets and the suppliers within these markets. Fifth, PJM implements the test by measuring the "effective supply" of congestion relief in a manner that leads to counter-intuitive results. All else equal, the test is more difficult to pass for those interfaces which are less severely constrained (*i.e.*, those interfaces which have lower "shadow prices" when compared to more severe transmission constraints). Finally, the report raises concerns over how mitigation is implemented based on the results of the three jointly pivotal supplier test.

The report recommends that PJM consider the following actions to make the PJM market power mitigation process more consistent with the proposed best practices framework and guidelines:

- (1) Work with FERC to define "market power" and "market power abuse" more clearly.
- (2) Eliminate the exemption of "grandfathered" generating units from automatic mitigation.
- (3) Make the application of the market power screens more transparent to market participants.
- (4) Consider adding a conduct-and-impact assessment to the existing structural screen, using the structural screen as a first step and the conduct-and-impact assessment as a second step.
- (5) Consider alternative structural screens to the three jointly pivotal supplier screen and analyze the potential for over-mitigation implied by the three jointly pivotal supplier screen.
- (6) Analyze whether identifying suppliers that can provide congestion relief to an individual constraint results in economically sensible delineations of geographic markets.
- (7) If the three jointly pivotal supplier test is retained, consider modifications to address the identified concerns, as well as applying it less frequently (particularly if the test is used only as a first-stage screening mechanism).
- (8) Analyze the appropriateness of the reference levels used for mitigation, and the treatment of frequently mitigated suppliers.