Market Power and Market Monitoring –
Critical Issues for SERC and Competitive Wholesale Markets

I. Introduction

Designing, and implementing, a competitive generation market is no easy task. Maintaining the competitiveness of the market is even more difficult. Experience shows that once market rules are written, competitors will seek out and take advantage of every weakness and ambiguity in the market rules. A critical function for SERC will be to monitor the markets for any sign of abuse and take corrective action quickly and efficiently.

Market power can be exercised in many ways. Not all abuses require a high market share or collusion between participants. Some actions by generators may not be illegal or directly violate a market rule, but they may nevertheless be unanticipated. Undesirable, and undermine the competitiveness of the market. These abuses will need corrective action. The Electricity Law should authorize SERC to monitor and correct for the widest possible range of market abuses.

Close attention to market power and market monitoring is essential. There are three separate, but related, issues to consider: (1) market structures and related rules that can moderate market power; (2) institutions and rules for market monitoring, and (3) rules and practices to correct market power problems and abuses, when they arise.

II. Market Structures to Manage Market Power

A. Essential Elements of a Competitive Market Framework

Market monitoring is not a substitute for sound market structure. Electricity markets are especially vulnerable to market power problems, even in the absence of intentional abuse. To deliver any of the potential benefits of market competition, the market must be structured so as to minimize the potential for the exercise of generator market power. The key elements of a sound market structure include[1]:

- *An adequate number of competing generators*. Market power will exist in any market, submarket, or time period in which generators have the capability to raise prices or threaten system reliability by withholding generation. There is ample evidence that withholding can and will occur if a generator has enough capacity to benefit from withholding some of it.[2] The market power of

[1] For more detail on these aspects of market structure, see (DM: RAP papers and SERC documents cited here?)

[2] There are now numerous studies on this point. For example, one study of the California price spikes found that the "actual prices in June, July, and August 2000 were higher than the benchmark prices by 90%, 56% and 36%, respectively. These price discrepancies were consistent with the hypothesis that the exercise of market power (raising prices above competitive levels and holding supply below competitive

generators is not likely to be eliminated solely by dividing up the generation sector into 6, or so, competing companies. Argentina has nearly 40 competing generation companies, with the largest having no more than 15% of total capacity. The NORD POOL has more the 50 with the largest having less than 10%. In New York, authorities concluded that 5 large generators would be to few, and imposed mitigation plans even though there are 10 to 12 serious competitors.[3] The UK has employed long-term hedging contracts ("contracts for differences") and active market oversight to constrain the power of the small number of generators created in their restructuring program.

- *Resource adequacy rules and energy efficiency policies* to improve reserve margins generally. In a rapidly-growing electric sector, market power will be a continual challenge as demand growth erodes capacity margins.[4] An adequate resource base of generation and demand-side resources is needed over time, along with forward-looking policies to promote their development.

- *Open access to transmission*. Rules for transmission and reliability must apply to all resource providers on an equal basis. Generators must be unable to use the transmission system to enhance their competitive positions.

- *Portfolio management practices by power providers*, combining resources of different types and durations, including a large proportion of long-term bilateral contracts. The short-term spot market should be limited in size, so that short-term price volatility will affect only a small percentage of total sales.[5]

- *A broad array of demand response opportunities*. The market power of generators can be countered and mitigated by customers who can reduce demand to meet economic or reliability goals. Customer responses include both longer-term energy efficiency improvements and shorter-duration load management opportunities.[6] Meaningful opportunity for customers and power providers to reduce demand at peak periods, and

- *Easy entry.* Clear rules that allow easy entry of all supply and demand-side participants can help limit market power.

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levels) had played an important role in determining market prices for those months." Joskow and Kahn, "Identifying the Exercise of Market Power: Refining the Estimates," (July 5, 2001) at p.2.

[3] Interview, New York Public Service Commission (James Gallagher and Mark Reeder)

[4] This is essentially what caused the California crisis. Rapid load growth in the states *around* California, and a drought that restricted hydro imports, left generators with market power and led to rapid price spikes.

[5] See, C. Harrington et al, "Portfolio Management: Protecting Consumers in an Electric Market That Isn't Working Very Well" (Regulatory Assistance Project July 2002) posted at www.raponline.org.

[6] For a review of demand side resources and the policies that could make them available to combat generator market power see, "Dimensions of Demand Response: Capturing Customer Based Resources in New England's Power Systems and Markets" (Report of the New England Demand Response Initiative, July 2003) posted at www.raponline.org.

> In the absence of sound market structures like those listed here, market monitoring will not be able to control market abuses or ensure efficient outcomes without greatly distorting outcomes and costing consumers money.[7]

B. Predicting and Measuring Market Power

The most important market power lesson from the past decade is that traditional economic tools to govern market power generally are inadequate in power markets. First, traditional anti-trust tests of market concentration (e.g., the HHI index) are simply not very helpful in a system where market power can develop differently in different locations, and in different hours of the year.[8] Some firms will have market power in some locations and in some hours, but not in others. And the patterns will change over time. As the Chairman of the California ISO Market Surveillance Committee stated after the 2000-01 power crisis,

> "As should be clear from the events in California from June 2000 to June 2001, the process FERC uses to determine whether a firm is eligible to receive market-based prices is fatally flawed. First, the dichotomy implicit in the FERC process that a firm either possesses market power or does not possess market power is factually false. Depending on conditions in the transmission network and the operating decisions of all market participants, almost any firm can possess substantial market power in the sense of being able to impact significantly the market price through its unilateral actions. Second, it is also extremely difficult, if not impossible, to determine on a prospective basis the frequency that a firm possesses substantial market power given the tremendous uncertainty about system conditions and the incentives they create…Finally (FERC's methodology) uses analytical techniques that have long been acknowledged by the economics profession as grossly inadequate…Because FERC granted market-based price authority to all sellers in the California market using a flawed and outdated methodology without any regulatory safeguards, it is not surprising that a sustained period of the exercise of significant market power and unjust and unreasonable wholesale prices occurred…."[9]

Measuring whether market power has been exercised. Market monitors and other analysts have developed a number of tools to determine whether generators are exercising market power in particular cases. A principal tool is called Competitive Benchmark Analysis. In

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[7] As one senior anti-trust official in the US joked, "I would love to be doing more collusion investigations, because that would mean that the power markets were working well enough that participants actually had to collude in order to break them." At the time, it was understood that US regional power markets all had structural defects compared to the list above.

[8] See Bushnell (2003) for a discussion of the limitations of concentration measures as indicators of market power in electricity.

[9] Frank Wolak, Professor of Economics, Stanford University, and Chairman of the Market Surveillance Committee, California Independent System Operator, testifying before the Senate Committee on Governmental Affairs (November 12, 2002) at pp 9-10.

this analysis, a computer model "bids" the marginal costs of each unit on the system for each time period, and "clears" that bid stack against actual load conditions. The intersection of the supply and demand curves sets what would be the *competitive market* clearing price in each time period. "These prices are then compared with actual historical prices; if there are substantial discrepancies between the two that cannot be explained away, then there is a strong suspicion of the exercise of market power."[10] This method may reveal whether market power has been exercised,[11] but it does not reveal which individual generators have exercised it.

To determine whether *individual generators* have exercised market power, or attempted to do so, a further step is required. Here, market monitors analyze the bidding and withholding behavior of individual generators to determine whether any withholding is the result of (a) forced outages due to maintenance, fuel, or related problems; (b) legitimate competitive decisions based upon low clearing prices or a justifiable desire to save output for anticipated higher-price periods; or (c) strategic withholding to raise market prices through the exercise of market power. As might be expected, this is not an easy task. As the authors of one study note,

> "For each major generation owner, we calculated the difference between total generation capacity and actual generation supplied using two separate data sets. In both instances, we found a significant "output gap" which would not be explained by the need for ancillary services or by transmission congestion. This output gap can only be the result of either unusually high forced outages or withholding behavior. While it is impossible to prove that any given generating unit declared as a forced outage could have been available, the incentive to withhold is powerful and the observed behavior exceeds historic outage norms."[12]

Thus, in order to measure market power and determine which generators have exercised it, market monitors need to conduct two different kinds of analyses: market-wide studies that test whether prices are competitive generally, and unit-by-unit analyses that assess the behavior of individual generators.

III. Responsibilities of the Market Monitor

As the above discussion demonstrates, market monitoring is an essential task for the efficient operation of competitive wholesale electricity markets. By tracking market data

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[10] R. Rajaraman and F. Alvarado, "(Dis)Proving Market Power" (Christensen Associates, January 2002) at p.5

[11] While this logical approach is used by market monitors, careful analysts note that it is subject to numerous practical and theoretical constraints. Deviations from the theoretical market clearing price might well be due to transmission constraints, complex interactions between the short-term energy and reserves markets, effects of hydroelectric dispatch, and several other elements. The main point here is that these market power reviews are very data intensive, and require sophisticated judgments by the market monitor as to the reasons why actual market prices may differ from the theoretically competitive price. See, e.g., S.M.Harvey and W.W. Hogan, "Market Power and Withholding," December 2001.

[12] "P.Joskow and E. Kahn, "Identifying the Exercise of Market Power: Refining the Estimates," (July 2001) at p.3.

such as prices, loading, and congestion, market monitors can assess the extent to which a market is operating in a competitive manner. In addition, an in-depth look using scenario analysis and strategic metrics, such as measures of market power potential, further enhances their ability to assess market competitiveness. When departures from competitive conditions are found, detailed system studies assist in the identification of underlying causes and problems, and allow system operators to take mitigating actions. Long-term market monitoring also serves to illuminate deficiencies in market design and operation and leads to enhancements to improve market structure.

Market monitoring is essential to control potential market abuses by market participants, but is also important simply to monitor how the markets are working, and to look for ways to improve market rules and practices for better overall performance over time.

Market monitoring requires the exercise of considerable judgment, as well as the use of advanced tracking and modeling techniques. For these reasons, it is crucial that market monitors (a) be highly professional, (b) have adequate resources, and (c) have the independence and authority needed to identify market problems, and call for their correction.

A. Essential roles. The essential role of market monitoring is to ensure that markets are workably competitive, both in real-time and over the longer term. This involves two kinds of actions, which are related:

- Monitoring should identify market abuses when they occur, so that particular corrective actions can be taken (including imposing bid caps, restating clearing prices to efficient levels, and recommending penalties for abusive market behavior);
- Monitoring should identify weaknesses in market rules and structures, so that regulators (e.g.,SERC) can consider reforms to improve long-term efficiency.
- Monororing should be based on high-quality data on market operations.

B. Specific responsibilities and authorities. A key lesson from market monitoring experience in several nations is that the precise role of the market monitoring will vary according to the market rules, generator characteristics, and industry traditions of the power system in question. Thus, the following list is intended to suggest the *types* of actions that market monitors might take, without being specific about what would be required in China. Market monitors are often responsible for:

- Monitoring market participants' compliance with the rules, standards and procedures of the market;
- Looking for the exercise of improper market power, including physical withholding, economic withholding, misuse of must-run status, gaming of bidding rules, etc.;
- Proposing or imposing bid caps in one or more markets, and in load pockets;
- Advising regulators on the potential impacts of divestiture, merger, and acquisition proposals;

- Proposing or imposing "bid mitigation" decisions, revising bids that are outside of proper bidding behavior, or are the result of flawed market conditions (thus, they may restate received bids, in some cases after the market in question has cleared);
- Suggesting sanctions or penalties for physical withholding, underscheduling load, failure to follow ISO instructions, inaccurate bid information, etc.
- Making market information available to participants and regulators (in some cases, daily information is made public; but in most cases only aggregated data are made available so as to protect individual bids from public release); and
- Recommending changes to market structures, rules, and operations so as to improve the long-term effectiveness of the power system and markets.

C. Market Monitoring Tools and Examples

1. Moderating generator market power through "contracts". Comparing California and New York

Market power is easier to exercise in spot markets than in long-term contract markets. Thus one way to reduce exposure to market power is to rely more heavily on long-term contracts. The failure to use long-term contracts is cited as one of the major reasons that costs rose so high in the California power crisis.[13]

The State of New York, on the other hand, employed contracts extensively as part of its transition to competition. Importantly, in New York market monitoring began *even before* restructuring and divestiture occurred. Careful analysis revealed particular power plants and locations in which market power might be exercised (at least at some hours of the year). To avoid this problem, the sales contracts for each individual power plant included terms and conditions under which the power output of the plant could be "called" by the buying utility at less than the spot market price in that location.[14] Purchasers are thus well aware of the limitations they face in capturing very high market prices, and can adjust their power plant purchase bids accordingly.

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[13] When California sought to impose such contracts after the fact, FERC refused to order the mitigation. This meant that to combat short-term price volatility, the State of California was required to enter in new long-term contracts with suppliers that reflected the market power advantage that the suppliers had achieved in the first place. "The most important lesson is that any re-structuring process should begin with a large fraction of final demand covered by long-term forward contracts." Wolak testimony, supra, at p.13. Market power mitigation has to begin even before divestiture occurs.

Another study of the California crisis found widespread strategic withholding, with one exception – a generator that had committed 90% of its output to long-term forward contracts. "…Duke's forced outage rates are far below what we observe for the other …generators on the high-price days. …It is well known in theory and clear from common sense that a generator that is fully contracted has no incentive to withdraw capacity. This shows that incentives matter." P.Joskow and E. Kahn, "Identifying the Exercise of Market Power: Refining the Estimates," (July 2001) at p. 28.

[14] These "call" contracts specify the rate that will apply. In some locations it is the plant's heat rate x the cost of fuel. In other cases, it is the market price outside of the load pocket. Within New York City (which is a large load pocket) generators must bid no more than their marginal operating costs, but they are paid a market clearing price based on units actually dispatched to serve the City.

Although not highly publicized, New York's negotiated mitigations are in place on power plants serving about half of the total load in New York State.[15]

2. Imposing bid caps, price caps, and bid limits in wholesale markets.

A second common form of market power mitigation is the imposition of constraints on bidding. One type of constraint is the bid cap, usually set according to a policy openly developed and announced in advance so that generators can adjust their bidding behavior across the board. When a bid cap is imposed, the market operators will not accept a bid higher than the cap, or will record any higher bid as though it were at the cap. This has the effect of cutting off the very high tail of the "hockey stick" price curve that has become common in these markets.

Bid caps have been imposed in many markets, with varying degrees of success. In December 2000, FERC imposed a "soft" price cap of $150 per MWH in California, but permitted generators to bid above the cap, provided they could provide some justification for doing so. Because FERC did not examine these justifications very closely, bids were often above the cap.

In other cases, the caps have been more strictly enforced, but usually at higher price levels. The New England ISO, for example, has imposed a bid cap of $1000 per MWH, which has limited the financial impact of the highest potential peak power prices on a few occasions when regional margins were thin. The New York ISO imposes a bid cap on all generators within New York City (which is a very large load pocket). Generators must bid no higher than their marginal operating costs, but they will be paid a locational marginal price (LMP) based on the bid of the highest-cost unit dispatched to serve the City.

While an essential tool to moderate market power, bid caps are very controversial in the US. Some economists claim that occasional, high peak prices are essential to attract capital to build new generation. Others point out that financiers do not want to (and, in fact, won't) advance capital on such a speculative basis anyway. But most generators prefer the certainty of known bid caps to the uncertainty of "bid restatement" discussed below.

Long-term bidding. A different form of bid constraint has been employed successfully in Argentina. There, generators are required to post bids that remain effective not just for a single day (as in most spot markets) but for three months in advance. Bids do not have to be uniform across all hours, but the bid schedule must be posted well in advance of each day's market. This means that generators are unable to take advantage of short-term market conditions, and have much stronger incentives simply to bid their actual costs rather than engaging in complex day-ahead and day-of bid adjustments.

[15] Interview, James Gallagher, Director of Electricity, New York Public Service Commission.

3. Limitations on market-based rates for generators

As noted above, the US FERC has been criticized for using an outmoded "hub and spokes" methodology to determine whether generating entities should be eligible to receive market-based, rather than cost-based, rates. After the Western power crisis of 2000-2001, the Commission developed a new approach, called the Supply Margin Assessment (SMA). The SMA focuses on the size of a generator's assets in relation to the supply margin in the regional power market, taking into account transmission constraints. Where the generation owner controls generation resources that are larger in quantity than the supply margin (i.e., the excess of supply over peak demand), it has the potential to affect reliable service, and can exercise substantial market power. In this case, the Commission ruled[16]that the generation owner should be subject to price mitigation regulations.

FERC was focusing on the ownership of generating units in developing the SMA, but the logic is equally applicable to the operation of the units in the market context. What is important is the benchmark – when a single owner controls an amount of generation that is larger than the supply margin of the operating system under peak conditions, mitigation is called for. This rule of thumb is quite useful when attempting to construct generation markets. Thus, regulators should ask when creating or approving generation companies: "Does this company control generation in excess of the region's supply margin?" If it does, generation assets should be further divided, or pro-active market mitigation should be imposed.

4. Restating bids that appear to demonstrate market power.

Some corrective actions screen the offer prices from individual generators and alter bids if an offer price exceeds some bound around a "reference" price level.[17] The underlying rationale for this practice, called Automatic Mitigation Procedures (AMP), is that they apply corrective actions quickly. The longer it takes to accomplish corrective action, the more difficult it is to apply retroactive corrective measures to the entire market --which might well be necessary since clearing prices applying to all participants may well have been affected by the behavior in question. Commercial certainty for market participants is enhanced by a process that tells them quickly what prices must be paid (and received).

The increased reliance by the US ISOs upon more active pricing regulations under the rubric of market power is partly a response to the California crisis but also reflects a growing awareness by US power regulators that it is necessary to pay attention to specific market conditions, rather than relying entirely on market structures to eliminate market power problems. Thus, there is increasing sentiment to enable ISOs to apply corrective actions quickly. For example, ISO-NE states that the purpose of these procedures is "to mitigate the market effects of any conduct that would substantially distort competitive outcomes in the NEPOOL Market, while avoiding unnecessary interference with

[16] AEP Power Marketing, Inc. 97 FERC para 61.219 (Nov 20, 2001).
[17] Bushnell (2003) and Lesuitre and Goldman (2003)

competitive price signals and normal market operations." AMP allows the ISO to monitor and adjust participant offers for very obvious instances of market power.[18]

AMPs are typically applied in a multi-step process. First, Market Monitors apply a *conduct test* that compares offers received from participants to certain reference price thresholds. Reference prices are usually set as a specified rolling average of accepted offer prices from previous hours. Second, if bids trigger the conduct test, an *impact test* checks to see if the high bids exert a material impact on market prices. Third, if bids trigger both the conduct and impact tests, the ISO MMU will closely examine the specific case to determine if mitigation is required. In such a case, mitigation takes the form of replacing the offending offer with an offer based on the reference prices.[19] Market participants are required to accept prices based on the lower offer set by the MM.

5. Bidding rules changes and other corrective actions

Since the formation of wholesale competitive markets, market monitoring has uncovered a number of instances in which market participants have attempted to take advantage of their market power, to engage in "gaming" behavior, to create artificial congestion on transmission lines, or otherwise to manipulate "coupled" markets. Units known to be necessary for reliability and who have special contracts for their energy have been known to have mysterious outages – to the benefit of other units who received high price market rates. Offers have been made in the day-ahead market to create the appearance of congestion for inflating day-ahead prices or increasing the value of transmission rights.

Since the Western power crisis, investigations by FERC, State utilities commissions, the California ISO, and others have revealed a wide range of misleading and anti-competitive bidding strategies that were performed by major market participants. As is well known, these market manipulations helped to cause billions of dollars in increased power costs, ultimately leading to economic dislocation, utility bankruptcies, and corrective actions on an emergency basis in several US states.

While the bidding strategies and deceptive practices employed in the West are now becoming well known, it is important to understand that less dramatic – but still economically significant – examples arise as a matter of course on all wholesale power markets. One "routine" example, involves the manner in which imports into the PJM market region were treated by the PJM market.

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[18] Critics of market performance monitoring and mitigation policies, who often represent generators, argue that these policies as implemented often don't reflect the real value of scare resources, disincent long-term resource development, and require extensive regulatory intervention. They suggest that the appropriate standard is the comparison between "imperfect competition" and "imperfect regulation", and that even imperfectly competitive bids should be allowed to stand. They see as arbitrary the actions of market monitors who would restate power bids delivered to the market, even it is an imperfect one.

[19] Lesuitre and Goldman, supra. at p.____.

Because PJM settles its markets using locational marginal prices, imports that can be delivered to some locations will be more valuable than imports delivered to other locations. In the summer of 2002, the PJM Market Monitor noticed large discrepancies between the amount of power scheduled to be delivered in its Southern and Western interfaces (importation points), and the amount actually delivered there. Because power was more valuable at the Southern interface, generators selling into PJM were "scheduling" delivery there, and were being paid on that basis, even though the physical characteristics of the system would not support such delivery. Due to grid conditions, the power would actually be taken at the Western interface. This situation had adverse effects on the transmission system; scheduled and actual flows varied substantially, sometimes by as much as 3000 MW, increasing transmission congestion and affecting system reliability.

In one particular instance, a power marketer actually purchased power *from PJM* at one interface, and then scheduled its return *into PJM* at another, higher-priced location. There were no net power flows in this scheduled loop, but the marketer pocketed the difference between the two prices.

As a result of the Market Monitor's investigations, PJM was made aware of these weaknesses in its market rules, and was able to take corrective action in the form of a change in the way imports are treated. The new rule treats all imports as though they are delivered to the lower-cost Western delivery point, thus eliminating the incentive to marketers to schedule delivery at a higher-priced location where transmission was not really available. This is just one example among many of the detailed investigations and operational practices that must be understood and monitored by market monitors.

IV. Institutional Issues for Market Monitoring Units

The job of the market monitor is demanding, both technically and in a political sense. It is crucial that market monitors have a clear mandate, adequate resources and information, and the administrative independence to do their jobs.

A. Information needs and capabilities. The key to the market monitoring function is the gathering and evaluation of data and information. The minimum information available to a monitor includes those data required to clear a market: generator availability, capacity and offer data (energy, reserves, regulation), scheduled flow for bilateral transactions, detailed network capability and conditions (capacity limits and likely contingencies for security-constrained optimal dispatch), and load requirements (bids); and information gained from the cleared markets including prices, dispatches, and network congestion. Additional data and descriptive information may also be available. For example, generator cost and operating information can be valuable when analyzing offers that lead to unusual prices.

Market monitors must be able to evaluate this information rapidly, and will need the software and modeling ability to track patterns of trades to look for improper bidding behavior and inefficient outcomes that may result from particular market rules.

B. Institutional home of the Market Monitor. As noted above, the market monitoring needs to track and assess system conditions and market operations on a close, daily basis. This suggests physically placing the function *within* the operations or trading center for the regional power system.[20] In the US the function is delegated to an independent entity within the market operator or the ISO. In China, it may make more sense to make it a regulatory function.

C. Adequate resources. Market monitoring requires adequate access to data, and the professional skill and judgment to interpret the data to reveal patterns of market behavior. This requires an adequate budget, and a highly-skilled (but not necessarily large) staff. The four RTOs operating Market Monitoring Units in the US have staffs of between 11 and 31 people, but importantly, they all have the ability to hire outside experts as well. The size of the budget and staff would, of course, depend on the scope of responsibility given the MM. For example, in the US, the New England and New York ISOs operate more markets than PJM does, so there are more complex opportunities for market abuses to occur (e.g., existence of an ICAP market gives participants the opportunity to "withhold" capacity by bidding the ceiling price for ICAP even when they have surplus capacity available – this occurred in New York, but not in PJM, which pays for ICAP differently). The size of the MM unit will also vary with the success of the underlying market structure and the number of daily transactions to track.

V. Market Monitoring Experience

As noted above, international experience with wholesale electricity markets has increasingly revealed the importance of market monitoring. Along with the fundamentals of market structure, market monitoring is now understood to play a very important role in creating efficient, competitive markets.

- In the UK, the regulator (Ofgem) has had to mitigate the problem of strategic capacity withdrawal by generators, and has an office (the Director General of

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- [20] PJM has a **Market Monitoring Unit** (MMU) within the PJM organization (which runs the power market and operates the system dispatch for the multi-state region). These employees are accountable directly to the President and Board of the RTO. There is no outside independent market monitoring entity.
- In New York (NYISO), and in New England (ISO New England) the MMU is staffed by ISO employees, accountable to their ISO organizations. Each of these pools also has an independent **Market Advisor**, reporting directly to the Board of the ISO.
- The California ISO established a **Market Surveillance Unit** within the ISO, and an outside **Market Surveillance Committee** (MSC), made up of 3 or more independent experts, not on the ISO staff. The MSC was intended to advise the ISO staff and CEO, as well as the ISO Board directly.

Electricity Supply, or DGES) that investigates market abuse issues and recommends actions by the UK's Competition Commission.

- In Scandinavia, market monitoring has been handled historically at the national level in each of the four countries that make up the Nord Pool. However, at the end of 2000 the Nord Pool decided to create an independent dedicated department focused on market surveillance, but without power to impose sanctions on market participants.

- In Australia, the Competition and Consumer Commission regulates electricity and competition issues generally. This entity (the ACCC) has a market surveillance program to ensure the "effectiveness, efficiency and equity" of the electricity market. It measures the gap between forecast spot prices and actual spot prices on a daily basis in order to uncover any non-competitive biding behavior. Bid data are revealed to the public on a daily basis, with only a one-day lag.

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- The U.S. Experience:

The US has so far launched four regional bid-based power markets (PJM, California, New England, and New York). In all four, market power problems have arisen. Examples include: shortages leading to very high prices, sometimes even in off-peak periods; bids based on complex "gaming" of system rules; strategic withholding of resources from the market to drive up prices; and misrepresentation and collusion. The US FERC and regional authorities in all four regions have established Market Monitoring programs in response to these types of problems.

It is worth noting that the market monitoring plans of the three Northeast ISOs differ significantly. PJM's market monitoring unit has a small staff and no general authority to mitigate bids or impose sanctions and penalties; it performs primarily a monitoring function, only. However, PJM has the authority to cap bids of must-run units in local load pockets, which is done outside of the market monitoring process. FERC has stated that it is not essential for an RTO to have mitigation authority, and accepted PJM's proposal, which does not include a request for mitigation authority.

ISO New England was given bid mitigation authority, but this has been quite controversial (market participants do not want their transactions subject to "second-guessing" by the MM). ISO-NE has a medium sized staff and the authority to mitigate bids before the market clears, impose sanctions and penalties, and also mitigate congestion payments for generators in "non-competitive" conditions.

In the New York Order, FERC approved the NYISO's proposal and its market mitigation and sanctioning authority. NYISO has the largest staff and the most

extensive monitoring and mitigation process of the three northeastern US ISOs. Furthermore, NY and NE have "outside" market advisors – entities that advise the ISO Board but are not within the ISO corporate organization, while PJM does not.

VI. Conclusion:

Practice in the area of market monitoring is still evolving in the US as it is elsewhere. The important lessons from many markets are: (1) electricity markets create many opportunities for non-competitive behavior, and inefficient allocation of resources; (2) active market monitoring is needed to discipline participant behavior and to develop advanced, factually-based market structure reforms; (3) while there are many lessons to be learned from market successes and abuses across the world, the problems that arise will be highly factually specific, and thus the market monitoring function must be based on each market's characteristics, and must be permitted to evolve to meet new needs in each market; and (4) market monitors must have the resources and authority to conduct these tasks on a continuing basis as an integral part of the market system.