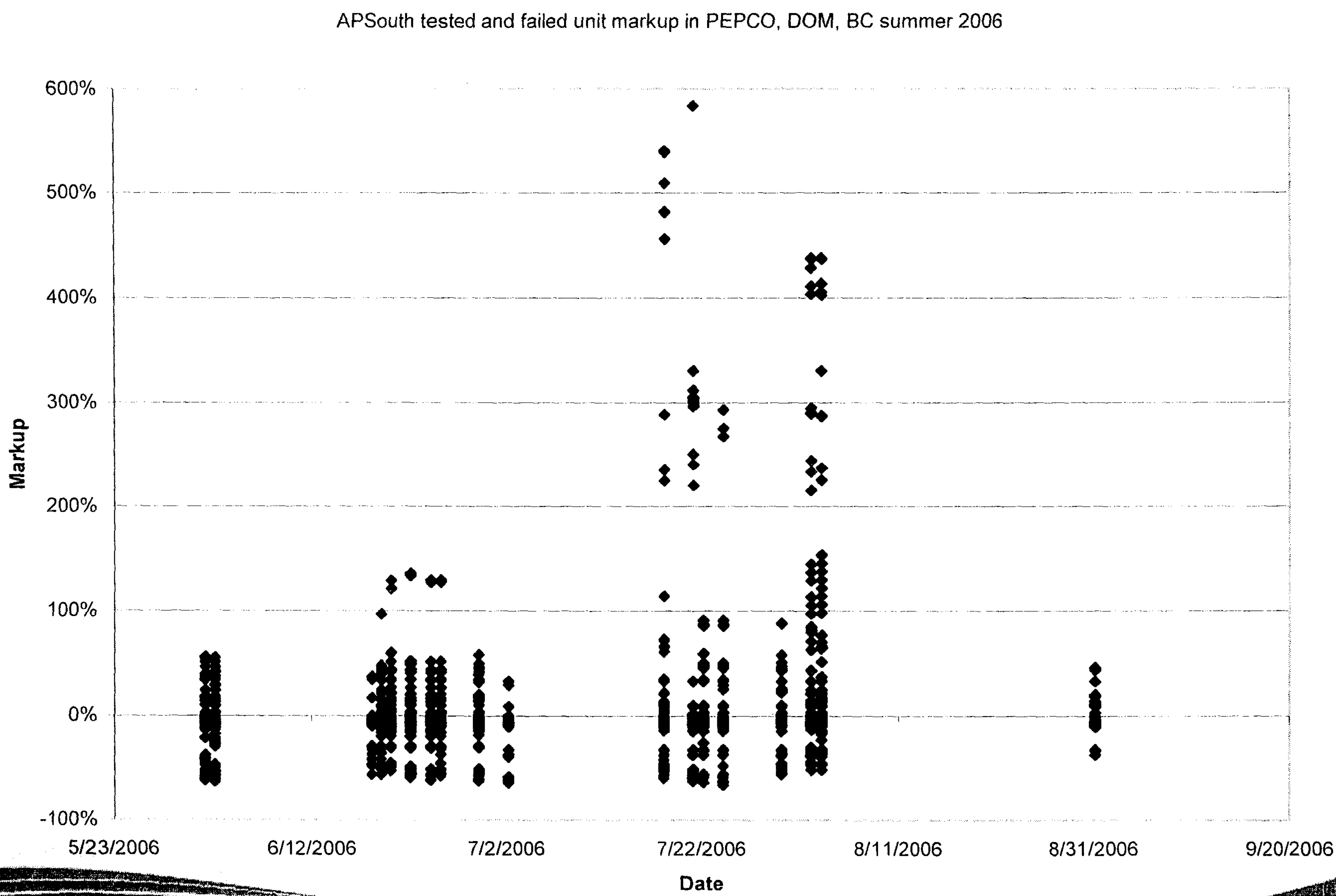
# Markups for Units Failing TPS




SMM - 01148

# Oscillations

- The market tested by the TPS in a given interval is the market that is relevant to the relief of the constraint in that interval.
- The relevant supply consists of incremental, effective MW of supply that are available at a price less than or equal to 1.5 times the clearing price.
- Units included in relevant supply vary by interval tested and by actual market conditions during that interval.
- When the clearing price is low, peakers will not be part of potential supply. When the clearing price is high, coal-fired steam will be loaded and not part of relevant supply.
- When ownership varies by location on the supply curve, the results of the TPS test will vary by interval.

SMM - 01149

# Conclusion

- PJM evidence does not support a conclusion of an absence of market power.
- Structure: Available evidence shows the relevant market, the market to relieve the APSouth constraint, has a non-competitive market structure 52% of the time it was tested between March 1 and August 31, 2006.
- Behavior: Available evidence shows that participants who are part of available supply for the APSouth TPS test have significant mark-ups.
- Performance: Available evidence shows that participants who failed the APSouth TPS test have mark-ups that, in the absence of capping, would have a significant impact on market-outcomes.

SMM - 01150

# Next Steps

- MMU will continue to issue quarterly reports per the OA requirement.
- MMU recommends a joint MSD/MMU examination of the application of TPS in Real-Time Market and Day-Ahead Market.
- MMU recommends that MSD apply TPS to exempt interfaces in Day-Ahead Market.
  - Exempt interfaces are more frequently constrained in DA than RT.
  - Need data on test results in order to do complete evaluation of the impact of exempt interfaces.

SMM - 01151

-

**From:** <ott@pjmexch01.pjm.com>
**To:** <bowrij@pjmexch01.pjm.com>
**Date:** 2/12/2007 12:23 PM
**Subject:** RE: MIC slides

---

I have big problems with the markup slides that were not resolved. the other slides were fine I think but I question the value at this point of just posting them w/o a meeting scheduled to discuss them. Logistically what are you suggesting we do ?

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**Sent:** Monday, February 12, 2007 9:32 AM
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**Subject:** MIC slides

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Have your folks looked at the mark up data?
Do you have any other concerns about the slides.

**From:** <ott@pjmexch01.pjm.com>
**To:** <bowrij@pjmexch01.pjm.com>
**Date:** 2/12/2007 5:53 PM
**Subject:** RE: MIC slides

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**To:** <bowrij@pjmexch01.pjm.com>
**Date:** 2/12/2007 7:56 PM
**Subject:** RE: MIC slides

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I do disagree with the way you actually calculated markups

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**Sent:** Monday, February 12, 2007 6:03 PM
**To:** Ott, Andy
**Subject:** RE: MIC slides

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Same issue as with your other markup analysis, it is flawed because you fail to account for competition from other units with the marginal unit .

But, I do not think email exchange is the way to address complex items like this so .... Please, Joe, schedule an in person meeting to discuss this the next time you plan to be in the office I am in Wednesday, Thursday and Friday this week, I hope you could plan to be in one of those days to meet with me on this and the other issues .

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**From:** Bowring, Joseph
**Sent:** Monday, February 12, 2007 7:58 PM
**To:** Ott, Andy
**Subject:** RE: MIC slides

Tell me how and why you disagree so that I can understand and discuss.

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Do you have any other concerns about the slides.

-----Original Message-----
From: Zibelman, Audrey A.
Sent: Wednesday, March 01, 2006 11:00 AM
To: Ott, Andy; Bowring, Joseph
Cc: Harris, P.G.; Kormos, M.J.
Subject: Re: SOM

Thanks
-----------------

-----Original Message-----
From: Ott, Andy
To: Zibelman, Audrey A.; Bowring, Joseph
CC: Harris, P.G.; Kormos, M.J.
Sent: Wed Mar 01 09:43:36 2006
Subject: RE: SOM

Joe and I met this morning and the immediate issue has been resolved by changing the conclusions section of the SOM.
Joe, Mike and myself will meet in the near future to discuss the regulation market analysis in greater detail and to develop a plan for resolving the regulation market mitigation structure.

-----Original Message-----
From: Zibelman, Audrey A.
Sent: Tuesday, February 28, 2006 6:08 PM
To: Bowring, Joseph
Cc: Harris, P.G.; Ott, Andy; Kormos, M.J.
Subject: RE: SOM

Joe - let me be clear. As you are aware both Andy and Mike have concerns about the validity of your analytic approach to the regulation market and the conclusions you are drawing as a consequence. They are both concerned that the information presented to the Board is different then the information in the current version of the state of the market report. Under our processes we were to have a staff opportunity to review the SOM before it is presented to the Board. By changing the underlying analysis and conclusions after the fact your are not adhering to the process we outlined. The reason we have it that way is to provide the Board the opportunity to hear about concerns others may have. Your approach deprives PJM and the Board of that opportunity.

I am not sure what changes you are now proposing to make. Certainly what you are suggesting is an improvement others may conclude is reduction in the quality of analysis. I suggest that you work with Mike and Andy to make sure that they do not see wholes in your analysis that were not there in the earlier versions.

Audrey

-----Original Message-----
From: Bowring, Joseph
Sent: Tuesday, February 28, 2006 5:30 PM
To: Zibelman, Audrey A.
Subject: SOM

Audrey,
I wanted you to be aware that it is not possible to literally go back to the draft version of the regulation market write up as the underlying analysis and write-up has been updated and improved here as elsewhere in the SOM. I am assuming that you want me to change the conclusion regarding the competitiveness of the combined markets rather than change the analysis. Please let me know if that is not correct.
- Joe

**From:** Bowring, Jos...
**Sent:** Wednesday, March 01, 2006 5:...
**To:** Smith, Carl W.
**Subject:** RE: Ancillary

Sorry - wrong version. Correct version now posted.

-----Original Message-----
**From:** Smith, Carl W.
**Sent:** Tuesday, February 28, 2006 9:26 PM
**To:** Bowring, Joseph
**Subject:** RE: Ancillary

Joe-
I looked at the Ancillary version on the J drive, and there are no changes tracked in the document, except for refreshes of figure numbers. Are you sure you put the updated version out there? The time stamp says it was last saved at 6:22 PM tonight.

Thanks,
Carl

-----Original Message-----
**From:** Bowring, Joseph
**Sent:** Tuesday, February 28, 2006 9:02 PM
**To:** Smith, Carl W.
**Subject:** RE: Ancillary

It is now the version out on the J drive. Can you take it from there?
I will let you know if there are more changes.

-----Original Message-----
**From:** Smith, Carl W.
**Sent:** Tuesday, February 28, 2006 8:21 PM
**To:** Bowring, Joseph
**Subject:** RE: Ancillary

Joe-
I would send them. Creative Services has blasted through all of the issues that I have logged, so any progress they could make would be added value. Even if they have to change it again.

Major stuff, or minor?

Carl

-----Original Message-----
**From:** Bowring, Joseph
**Sent:** Tuesday, February 28, 2006 8:18 PM
**To:** Smith, Carl W.
**Subject:** RE: Ancillary

I am dealing with interventions from up the ladder - have made changes but not sure they are yet final. Should I send along anyway?

-----Original Message-----
**From:** Smith, Carl W.
**Sent:** Tuesday, February 28, 2006 8:06 PM
**To:** Bowring, Joseph
**Subject:** Ancillary

Joe-
Tonight, I'm working on verifying that all found defects have been implemented into Word documents (at least the overviews) so Linda can proceed with the Intro.

I'm also planning on doing my own review of Ancillary, but you mentioned to me today that you were going to be making changes to Ancillary. What's the scoop?

Thanks,
Carl

-----Original Message-----
**From:** Bowring, Joseph
**Sent:** Tuesday, February 28, 2006 1:21 PM
**To:** Smith, Carl W.
**Subject:** Ancillary

Carl,
I am going to have to modify the Ancillary section. Will try to complete by COB.
- Joe

Key e-mails regarding MIC slides:

- Andy Ott's e-mail with his slides
- Dr. Bowring's e-mail and his slides
- E-mails between Dr. Bowring and Mr. Ott regarding the posting of Dr. Bowring's slides

-----Original Message-----
**From:** Ott, Andy
**Sent:** Sunday, January 28, 2007 8:11 PM
**To:** Kormos, M.J.; Zibelman, Audrey A.; Bresler, Frederick S. (Stu) III; Bowring, Joseph
**Subject:** APSOUTH Interface Analysis

As we discussed on Friday afternoon, I have created a draft version of the slides that I propose to post tomorrow for the MIC discussion of this topic on Wednesday . These slides are similar to those we reviewed on Friday but I removed the specific dates/hours and revised the comments in prep. for public posting

I would like to have any comments of discussion on these completed by noon tomorrow

Joe, please forward any slides you may have as soon as you can

# APSouth Interface
# Three Pivotal Supplier Test Evaluation

Andrew Ott
PJM MIC Meeting
1/31/07

# MMU Analysis of Exempt Interfaces

- On October 18, 2006, the PJM MMU issued its required quarterly report regarding offer capping exemptions on PJM Reactive Interfaces.
- The MMU recommended that the offer capping exemption applicable to West, Central, East, and APSouth Interfaces be terminated.
- The report included, for each of the four exempt interfaces, an analysis of 5-minute intervals for which at least one generation owner failed the Three Pivotal Supplier (TPS) test during a six-month period from March 1 through August 31, 2006.
- MMU report stated that the APSouth interface had the most intervals for which at least one supplier failed the TPS test: 250 failed intervals out of 483 intervals tested (52%) over the six month period.

SMM - 01166

# PJM MMU evaluation of Exempt Interfaces

**PJM MMU Application of Three Pivotal Supplier Test to Exempt Interface Constraints**

| Interface | Total tests applied | Number of tests with one or more failing owners | Percent of tests with one or more failing owners |
|---|---|---|---|
| TRANSFER INTERFACE: APSOUTH | 483 | 250 | 52% |
| TRANSFER INTERFACE: CENTRAL | 16 | 3 | 19% |
| TRANSFER INTERFACE: EAST | 11 | 5 | 45% |
| TRANSFER INTERFACE: WEST | 88 | 16 | 18% |

SMM - 01167

# PJM Analysis of MMU Report

- PJM staff issued a response to the MMU analysis.
- PJM staff in its response highlighted the fact that 250 failed intervals represents less than one half of one percent of the 52,992 total intervals in the six month period.
- PJM Staff also indicated that there has been no finding of market power abuse related to the APSouth constraint.
- Given these facts, PJM staff declined to seek a change to the offer capping exemption for these interfaces pending further analysis.
- PJM staff recommended that further analysis be conducted as follows:
  - Evaluate the material impact of not offer capping for the APSouth constraint for the analysis period
  - Evaluate generation offers market participants with respect to price based offers since the exemption was implemented to determine if offers price-based materially increased more than cost-based offers.




SMM - 01168

# PJM Evaluation of MMU Results

Three Pivotal Supplier Test Results for Exempt Interfaces (March 1, 2006 – August 31, 2006)

| Exempt Interface | Number of Intervals with one or more failing owners | Total Number of Intervals in Period | Percent of Intervals with one or more failing owners |
|---|---|---|---|
| AP South | 250 | 52,992 | 0.47% |
| Central | 3 | 52,992 | 0.01% |
| East | 5 | 52,992 | 0.01% |
| West | 16 | 52,992 | 0.03% |




SMM - 01169

# Impact of Offer Capping Exemption

- Markets staff evaluated each of the 250 intervals for which APSouth interface failed the three pivotal supplier test.
- Evaluation process
  - Determine if any units were called on, out of merit order, for APSouth constraint on their price-based schedule
  - Determine if there were any off-line units that could have been called on for the APSouth on cost-based offer that was less expensive than actual dispatch result.
  - If either of the above conditions existed, rerun the dispatch case and LMP with offer capping exemption for APSouth removed.
  - Compare the re-executed LMP results to original LMP results to evaluate the impact of APSouth offer capping exemption




SMM - 01170

# PJM Staff Additional Analysis - Process

- Of the 250 failed intervals, 166 did not require detailed analysis because either:
  - No units were logged as running for the APSouth constraint;
  - No units that were logged for the APSouth constraint were running on their price schedules; or
  - No off-line units that could have been called on for the APSouth constraint had a cost based offer that was economic
- 84 intervals were therefore evaluated in detail to determine the price impact of offer capping for the APSouth constraint.
- Of the 84 intervals analyzed in detail, 7 were found to result in price changes when offer capping exemption was removed for the APSouth constraint




SMM - 01171

# Hourly Integrated Zonal Price Changes – For the 7 affected hours

| Hour | PEPCO Zone | BC Zone | DOM Zone |
|---|---|---|---|
| A | -$5.17 | -$4.92 | -$2.25 |
| B | -$1.67 | -$1.50 | -$0.58 |
| C | -$4.42 | -$3.83 | -$6.08 |
| D | -$4.33 | -$5.58 | -$1.75 |
| E | -$6.42 | -$5.67 | -$4.92 |
| F | -$2.75 | -$4.75 | -$2.67 |
| G | -$12.50 | -$9.83 | - $10.08 |
| Average Change over the Seven affected hours: | -$5.32 | -$5.15 | -$4.05 |
| Average Change - All Hours: | -$0.008 | -$0.008 | -$0.006 |



SMM - 01172

# Three Pivotal Supplier Test for APSouth

The three pivotal supplier test results that were executed on affected days are summarized below:

| Date | Total TPS Tests | TPS Tests - Failed | TPS Tests Passed | Oscillations |
|---|---|---|---|---|
| A | 29 | 12 | 17 | 10 |
| B | 32 | 8 | 24 | 6 |
| C,D | 38 | 11 | 27 | 8 |
| E,F | 45 | 26 | 19 | 16 |
| G | 23 | 14 | 9 | 4 |




SMM - 01173

# PJM Observations

- Detailed analysis indicated that only 7 of the 250 intervals would have resulted in a price difference had offer capping exemption not been in place
- No systematic changes to price offer  characteristics were observed when offer capping exemption was implemented
- The Three Pivotal supplier test results tend to oscillate (pass to fail or vice versa) in adjacent intervals

# PJM Conclusion

- The failure of the Three Pivotal Supplier tests for APSouth appear to be random rather than systematic
- The recommendation for the removal of the offer capping exemption for APSouth does not appear to be justified based on these results
- More analysis is required to investigate reasons for Three Pivotal supplier test result characteristics
- PJM would like to encourage stakeholder discussion on the issue




SMM - 01175

## Ancillary Service Markets

The United States Federal Energy Regulatory Commission (FERC) defined six ancillary services in Order 888: 1) scheduling, system control and dispatch; 2) reactive supply and voltage control from generation services; 3) regulation and frequency response services; 4) energy imbalance service; 5) operating reserve -- spinning reserve services; and 6) operating reserve -- supplemental reserve services.[1] Of these, PJM currently provides regulation, energy imbalance and spinning reserve services through market-based mechanisms. PJM provides energy imbalance service through the Real-Time Energy Market. PJM provides the remaining ancillary services on a cost basis.

Regulation matches generation with very short-term changes in load by moving the output of selected generators up and down via an automatic control signal.[2] Regulation is provided, independent of economic signal, by generators with a short-term response capability (less than five minutes). Longer term deviations between system load and generation are met via primary and secondary reserves and generation responses to economic signals. Spinning reserve is a form of primary reserve. To provide spinning a generator must be synchronized to the system and capable of providing output within 10 minutes.

Both the Regulation and Spinning Reserve Markets are cleared on a real-time basis. A unit can be selected for either spinning reserve or regulation or neither, but it cannot be selected for both. The Regulation and Spinning Reserve Markets are cleared simultaneously and cooptimized with the Energy Market and operating reserve requirements to minimize the cost of the combined products.

PJM does not provide a market for reactive power, but does ensure its adequacy through member requirements and scheduling.[3] Generation owners are paid according to the FERC-approved reactive revenue requirements. Charges are allocated to network customers based on their percentage of load, as well as to point-to-point customers based on their monthly peak usage.

During the last two calendar years, PJM has integrated five control zones. In the *2004 State of the Market Report* the calendar year was divided into three phases, corresponding

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1 75 FERC ¶ 61,080 (1996).

2 Regulation is used to help control the area control error (ACE). See Appendix F, "Ancillary Service Markets," for a full definition and discussion of ACE.

3 See "PJM Manual for Scheduling Operations, M-11," Revision 25 (August 19, 2005), p. 71.

to market integration dates. In the *2005 State of the Market Report* the calendar year is divided into two phases, also corresponding to market integration dates:[4]

- **Phase 1 (2004).** The four-month period from January 1 through April 30, 2004, during which PJM was comprised of the Mid-Atlantic Region, including its 11 zones,[5] and the Allegheny Power Company (AP) Control Zone.[6]

- **Phase 2 (2004).** The five-month period from May 1 through September 30, 2004, during which PJM was comprised of the Mid-Atlantic Region, including its 11 zones, the AP Control Zone and the Commonwealth Edison Company Control Area (ComEd).[7]

- **Phase 3 (2004).** The three-month period from October 1 through December 31, 2004, during which PJM was comprised of the Mid-Atlantic Region, including its 11 zones, the AP Control Zone and the ComEd Control Zone plus the American Electric Power Control Zone (AEP) and The Dayton Power & Light Company Control Zone (DAY). The ComEd Control Area became the ComEd Control Zone on October 1.

- **Phase 4 (2005).** The four-month period from January 1 through April 30, 2005, during which PJM was comprised of the Mid-Atlantic Region, including its 11 zones, the AP, ComEd, AEP and DAY Control Zones plus the Duquesne Light Company (DLCO) Control Zone which was integrated into PJM on January 1, 2005.

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4 See the *2004 State of the Market Report* for more detailed descriptions of Phases 1, 2 and 3.

5 The Mid-Atlantic Region is comprised of the Atlantic Electric Company Control Zone (AECO), the Baltimore Gas & Electric Control Zone (BGE), the Delmarva Power & Light Control Zone (DPL), the Jersey Central Power & Light Company Control Zone (JCPL), the Metropolitan Edison Company Control Zone (Met-Ed), the PECO Energy Company Control Zone (PECO), the Pennsylvania Electric Company Control Zone (PENELEC), the Pepco Control Zone (PEPCO), the PPL Electric Utilities Corporation Control Zone (PPL), the Public Service Electric and Gas Company Control Zone (PSEG) and the Rockland Electric Company Control Zone (RECO).

6 Zones, control zones and control areas are geographic areas that customarily bear the name of a large utility service provider operating within their boundaries. Names apply to the geographic area, not to any single company. The geographic areas did not change with the formalization of the control zone and control area concepts during PJM's Phase 3 integrations. For simplicity, zones are referred to as control zones for all three phases. The only exception is ComEd which is called the ComEd Control Area for Phase 2 only.

7 During the five-month period May 1, 2004, through September 30, 2004, the ComEd Control Zone (ComEd) was called the Northern Illinois Control Area (NICA).

- **Phase 5 (2005).** The eight-month period from May 1 through December 31, 2005, during which PJM was comprised of the Phase 4 elements plus the Dominion Control Zone which was integrated into PJM on May 1, 2005.

In both Phase 4 and Phase 5, PJM operated two Regulation Markets: one for the Mid-Atlantic Region and a second for the Western Region. On August 1 of Phase 5, PJM combined both into a single PJM Combined Regulation Market for a six-month trial period. After the trial period, based on analysis of market results and a report by the PJM Market Monitoring Unit (MMU), PJM stakeholders will vote on whether to keep the combined market.

During Phase 4, PJM operated three Spinning Reserve Markets: one for the Mid-Atlantic Region, one for the Western Region and one for the ComEd Control Zone. During Phase 5, PJM operated a fourth Spinning Reserve Market for Dominion.

The analysis treats each of the two Regulation Markets and each of the three Spinning Reserve Markets separately during Phase 4. The market analysis treats each of the two Regulation Markets separately during the May 1 through July 31 component of Phase 5 (Phase 5-a), and as a single Regulation Market during the August 1 through December 31 component of Phase 5 (Phase 5-b). Each of the four Spinning Reserve Markets is treated separately for the entire Phase 5 period.

## *Overview – Regulation and Spinning Reserve Markets*

The MMU has reviewed structure, conduct and performance indicators for the identified Regulation Markets. The MMU concludes that the Regulation Markets functioned effectively, except for some minor problems of insufficient regulation supply shortly after the start of Phase 5 and during times of minimum generation. The Regulation Markets produced competitive results throughout calendar year 2005 based on the regulation market-clearing price. The Regulation Market prices reflected the fact that offers in the Western Region were capped during Phase 4 and that the offers of two large participants, AEP and Dominion, were capped at cost plus a margin throughout Phase 5, in both cases because the Western Region Regulation market was determined to be not structurally competitive.

The MMU has reviewed structure, conduct and performance indicators for the identified Spinning Reserve Markets. The MMU concludes that the Spinning Reserve Markets functioned effectively. The Spinning Reserve Markets produced competitive results throughout calendar year 2005 based on the spinning market-clearing price. The Spinning Reserve Market prices reflected the fact that all offers were capped at cost plus a margin because the markets have been determined to be not structurally competitive.

## The Regulation Markets

The structure of the Mid-Atlantic Region and Western Region Regulation Markets was evaluated and the MMU concluded that these markets are not structurally competitive as they are characterized by a combination of one or more structural elements including high levels of supplier concentration, high individual company market shares, significant hours with pivotal suppliers and inelastic demand. The structure of the Combined Regulation Market was also evaluated based on the five months of available data and the MMU concluded that this market is characterized by lower levels of concentration, smaller market shares but a small number of dominant, pivotal suppliers and inelastic demand. The conduct of market participants within these market structures has been consistent with competition consistent with existing offer capping, and the market performance results have been competitive.

- **Mid-Atlantic Region.** The Regulation Market in the PJM Mid-Atlantic Region was cleared based on participants' price offers during Phases 4 and 5-a. All suppliers were paid the market-clearing price, which is a function of the supply curve and PJM-defined demand. The supply curve consists of offered and eligible MW and the associated offer prices which are a combination of unit-specific offers plus opportunity cost (OC) as calculated by PJM.[8]

- **Western Region.** The Regulation Market in the Western Region during Phase 4 was cleared based on participants' cost-based offers. The cost-based regulation offers are defined to be the unit-specific incremental cost of providing regulation plus a margin of $7.50 per MWh plus opportunity cost calculated by PJM. During Phase 5-a, the market was cleared using a combination of price-based offers and cost-based offers. In Phase 5, Dominion and AEP were required to make cost-based offers based on their dominant position in the market while other participants made price offers.

- **PJM Combined Regulation Market.** During the trial period for the PJM Combined Regulation Market, the market was cleared using a combination of price-based offers and cost-based offers. Dominion and AEP were required to make cost-based offers based on their dominant position in the market while other participants made price offers.

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8 As used here, the term, "opportunity cost" (OC), refers to the estimated lost opportunity cost (LOC) that PJM uses to create a supply curve on an hour-ahead basis. The term, "lost opportunity cost," refers to opportunity costs included in payments to generation owners.

## Market Structure

- **Demand**. Demand for regulation is determined by PJM based on an evaluation of the regulation required in order to meet reliability objectives. Required regulation remained constant for each control region throughout 2005 except for two periods during which a temporary adder was implemented at the direction of PJM.

- **Supply.** The supply of offered and eligible regulation in the PJM Mid-Atlantic Region was generally both stable and adequate, with an average 1.92 ratio of regulation supply offered and eligible to the hourly regulation requirement during Phases 4 and 5-a. While the average ratio of hourly regulation supply offered and eligible to regulation required was 1.64 for the Western Region during Phases 4 and 5-a, at times an inadequate supply of regulation was offered and eligible to participate in the market on an hourly basis in the Western Region. The average ratio of hourly regulation supply offered and eligible to regulation required was 1.88 for the PJM Combined Regulation Market during Phase 5-b.

### *Concentration of Ownership*

- **Mid-Atlantic Region**. During Phase 4 and Phase 5-a, the PJM Mid-Atlantic Region Regulation Market for eligible regulation had an average Herfindahl-Hirschman Index (HHI)[9] of 1751 which is classified as "moderately concentrated."[10] Less than 1 percent of the hours had an eligible regulation HHI above 2500. There were two suppliers with market shares greater than, or equal to, 20 percent. Seven percent of the hours had a single pivotal supplier, 48 percent of the hours had two pivotal suppliers and 88 percent of the hours had three pivotal suppliers.

- **Western Region.** During Phase 4 and Phase 5-a, the Western Region Regulation Market for eligible regulation had an average HHI of 2802 which is classified as "highly concentrated" and 58 percent of the hours had an HHI above 2500. There was a single pivotal supplier in 62 percent of the hours. One hundred percent of the hours had two pivotal suppliers.

- **PJM Combined Regulation Market**. During Phase 5-b, the PJM Combined Regulation Market had an average HHI of 1079 which is classified as

9 See Section 2, "Energy Market, Part I," at "Market Concentration" for a more complete discussion of concentration ratios and the Herfindahl-Hirschman Index (HHI).

10 The market structure metrics reported in this summary are based on regulation capacity that is both offered to the market and is eligible to provide regulation.

"moderately concentrated." No suppliers had market shares greater than, or equal to, 20 percent. During 1 percent of hours, there was a single pivotal supplier. During 6 percent of hours, there were two pivotal suppliers. During 29 percent of the hours, there were three pivotal suppliers. For all units except CTs, during 5 percent of hours, there was a single pivotal supplier, during 23 percent of hours, there were two pivotal suppliers and during 68 percent of the hours, there were three pivotal suppliers.

## Market Conduct

- **Offers.** The offer price is the only component of the total regulation offer price provided by the unit owner and is applicable for the entire operating day. The regulation offer price is subject to a $100 per MWh offer cap in the Mid-Atlantic Region, was subject to offer capping in Phase4 in the Western Region and was subject only to a $100 per MWh offer cap in Phase 5 in the Western Region, with the exception of the dominant suppliers, Dominion and AEP, whose offers were capped at marginal cost plus $7.50 per MWh plus opportunity cost. The average MW-weighted offer price for regulation in the PJM Mid-Atlantic region during Phases 4 and 5-a was $15.63. The average MW-weighted offer price for regulation in the Western Region Regulation Market during Phases 4 and 5-a was $7.73. For the PJM Combined Regulation Market during Phase 5-b, the average MW-weighted offer price for regulation was $16.29.

## Market Performance

- **Price.** For the entire PJM regional transmission organization (RTO) from January 1, 2005, to December 31, 2005, the average price per MWh (regulation market-clearing price) associated with meeting PJM's demand for regulation was $49.73. For the PJM region during Phases 4 and 5-a, the average price per MWh for regulation was $36.39. For the Western Region Regulation Market during Phases 4 and 5-a, the average price per MWh for regulation was $42.64. For the PJM Combined Regulation Market during Phase 5-b, the average price per MWh was $64.03.

## The Spinning Reserve Markets

The structure of each of the Spinning Reserve Markets has been evaluated and the MMU has concluded that these markets are not structurally competitive as they are characterized by high levels of supplier concentration and inelastic demand. As a result, these markets are operated as markets with market-clearing prices and with offers based on the marginal cost of producing the service plus a margin and opportunity cost. The conduct of market participants within these market structures has been consistent with competition, and the market performance results have been competitive. Prices for spinning in the PJM Mid-Atlantic Region, the ComEd Control Zone, the Western Region

and Dominion are market-clearing prices determined by the supply curve and PJM-defined demand. The cost-based spinning offers are defined to be the unit-specific incremental cost of providing spinning reserve plus a margin of $7.50 per MWh plus opportunity cost calculated by PJM.

## Market Structure

- **Demand.** Computed in accordance with the specific spinning reserve requirements, the average MW spinning requirement was: 1,091 MW, for the PJM Mid-Atlantic Region; 217 MW for the ComEd Spinning Zone; 437 MW for the Western Region; and 5 MW for the Southern Spinning Reserve Zone (May – December only).

- **Supply.** For the PJM Mid-Atlantic Region, the offered and eligible excess supply ratio was 1.15. For the Western and Southern Regions, the ratio was 1.76. For the ComEd Control Zone, the ratio was 1.21.

- **Concentration of Ownership.** In 2005, market concentration was high in the Tier 2 Spinning Reserve Market. The average offered and eligible Spinning Reserve Market HHI for the PJM Mid-Atlantic Region throughout 2005 was 2940. The average Spinning Reserve Market HHI for the Western Region was 4593. The average Spinning Reserve Market HHI for ComEd Control Zone was 8844. The average Spinning Reserve Market HHI for Dominion was 10000.

## Market Performance

- **Price.** Load-weighted, average price associated with meeting the PJM system demand for Tier 2 spinning reserve throughout 2005 was $14.41 per MW, a $0.45 per MW decrease from 2004. The load-weighted, average price in the PJM Mid-Atlantic Region for Phases 4 and 5 was $15.44 per MW. The load-weighted, average price for spinning reserve in the ComEd Control Zone during Phases 4 and 5 was $12.73. The load-weighted, average price for spinning in the Western Control Zone during Phases 4 and 5 was $13.23. The load-weighted, average price for spinning in Dominion during Phase 5 was $13.08.

## Conclusion

PJM consolidated its Regulation Markets into a single Combined Regulation Market effective, on a trial basis, effective August 1, 2005. PJM's consolidation of its regulation markets clearly resulted in improved performance and in increased competition. However, the improvement in HHI and maximum market share metrics was not enough to overcome the fact that there are still dominant suppliers in the Combined Regulation Market that are frequently pivotal and that therefore have the ability to exercise market power, aggravated by the presence of inelastic demand. Consistent with the FERC's order affecting the offer capping of dominant suppliers in the Western Region

Regulation Market, an effective means of reducing the probability of the exercise of market power would be to offer cap the dominant suppliers in the Combined Regulation Market. There is little downside to this approach in the presence of dominant suppliers. The market continues to be based on price offers for most sellers and all sellers are paid a market clearing price based on offers plus opportunity costs. The result of this design would be a competitive outcome and consistent with competitive offers from all participants whether offer capped or not. The marginal costs of providing regulation have been clearly defined and are consistent with the offers that would be made if the suppliers were behaving competitively.

PJM's Spinning Reserve Markets have worked effectively with offers based on marginal costs plus a margin and with all participants paid a market clearing price based on the marginal offer including opportunity costs, despite the fact that these markets are characterized by high levels of seller concentration and inelastic demand.

The benefits of markets are realized under this approach to ancillary services markets. Even in the presence of structurally non-competitive markets, there are transparent, market clearing prices based on competitive offers that account explicitly and accurately for opportunity costs. PJM should continue to consider whether additional ancillary services markets need to be defined in order to ensure that the market is compensating suppliers for services when appropriate.

## *Regulation Markets*

### Regulation Market Structure

Two major changes affected the structure of the Regulation Market in 2005. The first was the integration of Dominion into the Western Region Regulation Market on May 1, 2005. The second was the implementation of the PJM Combined Regulation Market on August 1, 2005.

### Demand

Demand for regulation does not change with price (is price inelastic). The demand for regulation is set administratively based on reliability objectives and forecast load. Regulation demand will be referred to in this report as required regulation.

The PJM Mid-Atlantic Region has different regulation requirements for on-peak hours and off-peak hours. The regulation requirement for the peak period is 1.1 percent of the peak-load forecast; for the off-peak period, it is 1.1 percent of the valley-load forecast.[11] During Phases 4 and 5-a, PJM Mid-Atlantic Region regulation requirements ranged from

[11] See "PJM Manual for Scheduling Operations, M-11," Revision 25 (August 19, 2005), p. 51.

226 MW of regulation capability for off-peak periods to 649 MW for on-peak periods. The average required regulation was 434 MW.

In the Western Region, the regulation requirement was 1.0 percent of the peak forecast load and did not vary between on-peak and off-peak periods. During Phases 4 and 5-a, the requirement ranged from 320 MW to 771 MW, averaging 517 MW.

During Phase 5-b, the PJM Mid-Atlantic Region and the Western Region Regulation Markets were combined into the PJM Combined Regulation Market. The regulation requirement for this combined market was defined to equal the sum of the separate regulation requirements for each region. During Phase 5-b, the regulation requirement ranged from 662 MW to 1,404 MW, averaging 978 MW.

Although the required regulation specification remained constant for each control region throughout 2005, a temporary adder was implemented at the direction of PJM for two periods. As a result, regulation was purchased in addition to the full regulation requirement. On October 23, 2004, in response to problems after the integration of the ComEd Control Zone into the Western Region, required regulation was increased by 75 MW for each regulation zone. This regulation adder was subsequently reduced until regulation was returned to its base requirement on February 11, 2005.

On April 15, 2005, in response to a persistent problem with frequency excursions, a 100 MW increment was added to the regulation demand for both the Mid-Atlantic and Western Regions. It was phased out and then eliminated on May 14, 2005. Table 0-1 contains a list of regulation adder amounts by date.

Table 0-1 Temporary regulation adder: October 23, 2004 to May 15, 2005 << **H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\regulation adder table.xls (tab:regulation adder)>>**

| Regulation Adder Date | Change in Regulation MW per Control Zone | Total Regulation Adder (MW) per Control Zone |
|---|---|---|
| 23-Oct-04 | 75 | 75 |
| 29-Oct-04 | (75) | 0 |
| 1-Nov-04 | 75 | 75 |
| 11-Nov-04 | 100 | 175 |
| 17-Dec-04 | (50) | 125 |
| 7-Jan-05 | (25) | 100 |
| 14-Jan-05 | (25) | 75 |
| 26-Jan-05 | (25) | 50 |
| 4-Feb-05 | (25) | 25 |
| 11-Feb-05 | (25) | 0 |
| 15-Apr-05 | 100 | 100 |
| 6-May-05 | (25) | 75 |
| 8-May-05 | (75) | 0 |
| 12-May-05 | 50 | 50 |
| 14-May-05 | (50) | 0 |

The temporary additional regulation requirements between mid-April and mid-May reflected an effort by PJM to solve simultaneous problems of insufficient regulation in the Western Region Regulation Market, particularly during off-peak hours, and frequency excursions that impacted PJM's compliance requirement for CPS2.[12]

Regulation obligation is determined hourly for each load-serving entity (LSE) by applying the real-time load ratio share (adjusted for scheduled load responsibility) to the actual amount of regulation assigned for that hour adjusted for any bilaterals and self-supply. The hourly regulation charge for each LSE is equal to the hourly regulation market-clearing price (RMCP) multiplied by the MW of regulation purchased from the market, plus the LSE's percentage share of any opportunity cost incurred by generation owners over and above the RMCP, plus the LSE's percentage share of any unrecovered costs incurred by those units called on by PJM for the sole purpose of providing regulation.

12 See Appendix F, "Ancillary Service Markets," for additional information on area control error (ACE) control and control performance standard (CPS).

## Supply

The supply of regulation can be measured as regulation capability, regulation offered, or regulation offered and eligible. For purposes of evaluating the Regulation Market, the relevant regulation supply is the level of supply that is both offered to the market on an hourly basis and is eligible to participate in the market on an hourly basis. This is the only supply that is actually considered in the determination of market prices. The level of supply that clears in the market on an hourly basis is called assigned regulation. Assigned regulation is selected from regulation that is both offered and eligible.

Regulation capability represents the total volume of regulation capability reported by resource owners based on unit characteristics.

Regulation offered represents the level of regulation capability actually offered to the PJM Regulation Market. Resource owners may offer those units with approved regulation capability into the PJM Regulation Market. PJM does not require a resource capable of providing regulation service to offer its capability to the market. Regulation offers may be submitted on a daily basis and these daily offers may be modified on an hourly basis.

Regulation offered and eligible represents the level of regulation capability actually offered to the PJM Regulation Market and actually eligible to provide regulation in an hour. Some regulation offered to the market is not eligible to participate in the Regulation Market as a result of identifiable offer parameters specified by the supplier. As an example, the regulation capability of a unit will be included in regulation offered based on the daily offer and availability status, but that regulation capability will not be eligible in one or more hours because the supplier sets the availability status to unavailable for one or more hours of that same day. (The availability status of a unit may be set in both a daily offer and an hourly update table in the PJM market software.) As another example, the regulation capability of a unit will be included in regulation offered if the owner of a unit offers regulation, but that regulation capability will not be eligible if the owner sets the unit's economic maximum generation level equal to its economic minimum generation level. In that case, the unit cannot provide regulation and is not eligible to provide regulation. As another example, the regulation capability of a unit will be included in regulation offered but that regulation capability will not be eligible if the unit is not operating, unless the unit is a combustion turbine that meets specific operating parameter requirements.

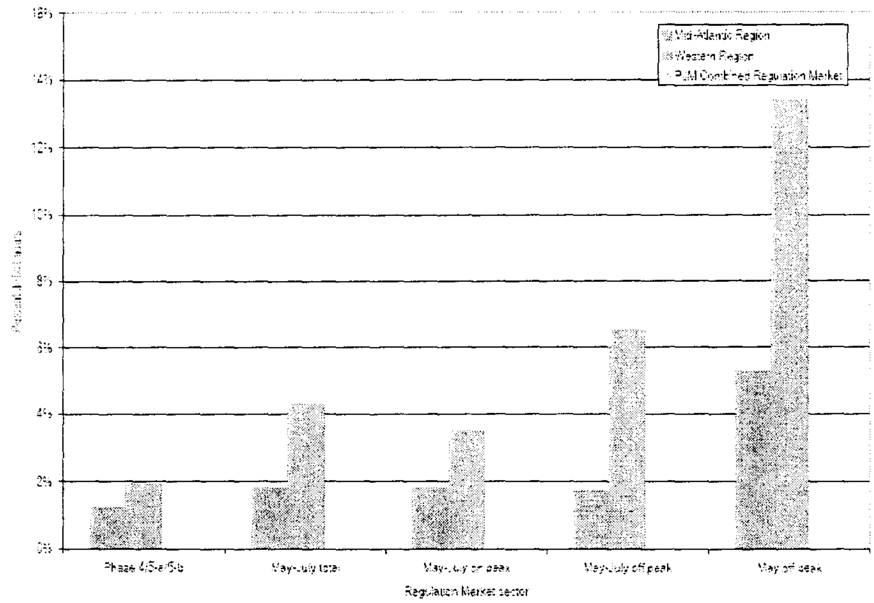
Only those offers which are eligible to provide regulation in an hour are part of supply for that hour, and only those offers are considered for purposes of clearing the market. Regulation assigned represents those regulation resources selected through the regulation market-clearing mechanism to provide regulation service for a given hour.

While the average regulation supply-to-requirement ratio of offered regulation in the Western Region Regulation Market during Phase 5-a was generally adequate at 1.70, the situation was more complicated than the supply-to-requirement ratio indicates. Regulation capacity was always adequate in the sense that the total reported capability was adequate.[13] Occasionally, however, PJM dispatchers had to redispatch generation uneconomically to satisfy reliability requirements. PJM encountered some difficulty with insufficient regulation supply in the Western Regulation Zone during Phase 5-a. Shortly after the Dominion integration on May 1, 2005, there was at times an inadequate supply of regulation that was offered and eligible to participate in the market on an hourly basis. This situation was most acute in the Western Region Regulation Market in May 2005 during off-peak periods when market solutions resulted in deficits 13.6 percent of the time and occasional off-peak hourly price spikes. (See Figure 0-1.) These higher than normal deficits generally occurred during off-peak hours when regulation-capable units were unavailable to regulate because they were not operating. In May, PJM frequently operated under minimum generation conditions, especially during off-peak hours. The combination of a regulation deficit and minimum generation conditions required dispatchers to balance the need for more regulation with the need for less generation. Dispatchers at times chose to operate with regulation deficits. This situation improved during June (deficits in 5.3 percent of all periods) and was resolved in July when the deficit percentage returned to its overall Phases 4 and 5-a average.

Figure 0-1 compares the percentage of regulation deficit hours across several Regulation Market periods, including all of 2005, Phase 5 only, off-peak and on-peak hours and off-peak hours in May. The abnormally high deficits that occurred in the Western Region particularly during off-peak hours in early May are clearly indicated.

13 See "Regulation Capacity, Daily Availability, Hourly Supply and Price," in Appendix F, "Ancillary Service Markets," for a definition of capacity, availability and supply.

Figure 0-1 Regulation deficit analysis: Calendar year 2005 <<H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\deficit study.xls (tab:graph)>>




Regulation deficits in the west were reduced during June and returned to normal in July. Also indicated in Figure 0-1 is the extent to which regulation deficits were all but eliminated after the PJM Combined Regulation Market. There was only one period of regulation deficit in the PJM Combined Regulation Market during Phase 5-b. This deficit does not show up in Figure 0-1 because the percentage of regulation deficit hours rounds to zero percent.

## Concentration of Ownership

### *Market Structure Definitions*

The market structure analysis follows the Commission logic specified in the AEP Order.[14] The logic of the delivered price test is followed by calculating market share, HHI and pivotal supplier metrics for each market configuration.[15] The analysis presented here differs in two ways from the Commission's delivered price test. The delivered price test would start with the universe of regulation offered and eligible and

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14 AEP Power Mktg. Inc., 107 FERC ¶ 61,018 ("AEP Order"), order on reh'g, 108 FERC ¶ 61,026 (2004).

15 AEP Order at 105 et seq.

then limit the analysis to those offered and eligible units that could provide regulation at less than or equal to 1.05 times the clearing price. The analysis here uses a proxy for the 1.05 times the clearing price definition used to define the relevant market. In PJM, the supply of regulation is bifurcated into an all units except combustion turbine (CT) segment (consisting of steam and hydro units) and a CT segment. While steam, hydro and CT units can and do provide regulation, the steam/hydro segment is significantly lower cost and is relatively homogeneous while the CT segment is significantly higher cost and similarly internally homogeneous. Rather than directly applying the 1.05 times the clearing price market definition, the analysis here focuses separately on the steam/hydro and the CT portions of the market. Focusing on the steam/hydro segment of the market is functionally equivalent to including only sellers that offer for a price equal to the clearing price times 1.05 when a steam/hydro unit is marginal, although the segment approach probably results in a larger market definition. Focusing on the CT segment is similarly equivalent to including only sellers that offer for a price equal to the clearing price times 1.05 when a CT unit is marginal, although again the segment approach probably results in a larger market definition. The data is presented including all units, all units except CTs (steam and hydro) and CTs. In addition, the analysis here includes the results of the one, two and three pivotal supplier tests.

The analysis here includes all regulation provided by each supplier and made offered and eligible. While the market structure results are reported for regulation offered, this is not directly relevant to a determination of whether a market structure is competitive. Regulation must be both offered and eligible in an hour in order for it to be part of the market. This is termed economic capacity under the delivered price test.

The delivered price test may also be applied using available economic capacity, or gross supply by participant net of their load obligation. The fact that suppliers have load obligations may affect their incentives to exercise market power although not unambiguously. However, as the amount of load that will be served by the integrated utilities in the future is unknown given the unknown extent of retail competition, a reasonable approach is to evaluate the entire regulation supply, or economic capacity, as is done here.

The Commission's AEP Order indicates that failure of any one of the specified tests is adequate for a showing of market power including tests based on market concentration, market share and pivotal supplier analyses. The analysis presented here goes further in order to analyze the significance of excess supply. The PJM Market Monitor applies the pivotal supplier test using one, two and three pivotal suppliers. In addition, when there are hours with one, two or three pivotal suppliers, the analysis also examines the frequency with which individual generation owners are in the pivotal group. If the hours that fail a pivotal supplier test have the same pivotal supplier for a significant proportion of the hours, that information can be used to identify dominant suppliers.

The pivotal supplier tests represent an analytical approach to the issue of excess supply. Excess supply, by itself, is not necessarily adequate to ensure a competitive outcome. A monopolist could have substantial excess supply but the monopolist would not be expected to change its market behavior as a result. The same logic applies to a small group of dominant suppliers. However, if there is adequate supply without the three dominant suppliers to meet the demand, then the market can reasonably be deemed competitive.

### *PJM Mid-Atlantic Regulation Market – Phases 4 through 5-a*

During Phases 4 through 5-a, in the Regulation Market in the Mid-Atlantic Region, the offer capability was 2,408 MW.[16] The level of regulation resources offered on an hourly level and the level of regulation resources both offered and eligible to participate on an hourly level in the market were lower than the total regulation capability. In 2005 the average hourly offer level was 1,128 MW or 47 percent of offer capability while the average hourly eligible offer level was 835 MW or 35 percent of offer capability.

The ratio of the hourly regulation supply offered to the hourly regulation requirement, averaged 2.60 for the PJM Mid-Atlantic Region during Phases 4 and 5-a. When this ratio equals 1.0, it indicates that offered supply exactly equals demand for the referenced time period. Based upon regulation offered and eligible, this ratio averaged 1.92. The average regulation requirement for the PJM Mid-Atlantic Region during 2005 was 434 MW.

Hourly HHI values were calculated based upon the regulation offered, regulation offered and eligible, and regulation assigned. Based upon regulation offered, HHI ranged from a maximum of 2064 to a minimum of 1088 with an average value of 1510. Based upon regulation offered and eligible, HHI values ranged from a maximum of 2787 to a minimum HHI of 1190, with an average value of 1751. Less than 1 percent of hours had an eligible regulation HHI above 2500. Based upon regulation assigned, HHI values ranged from a maximum of 9690 to a minimum HHI of 1118. The average HHI value for regulation assigned was 2260. Thirty-one percent of hours had an assigned regulation HHI above 2500. Table 0-2 summarizes the January 2005 through July 2005 PJM Mid-Atlantic Region Regulation Market HHIs.

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16 Offer capability is defined as the maximum daily offer volume for each offering unit during the period without regard to the actual availability of the resource.

Table 0-2 **PJM Mid-Atlantic Regulation Market hourly HHI: Phases 4 and 5-a< 14_Graphs_Tables\HHI_Tables.xls (Tab PJM HHIs) >**

| | Minimum | Average | Maximum | Percent Hours > 2500 |
|---|---|---|---|---|
| Offered | 1088 | 1510 | 2064 | 0% |
| Eligible | 1190 | 1751 | 2787 | 0% |
| Assigned | 1118 | 2260 | 9690 | 31% |

As noted above, regulation supply in PJM is bifurcated into the combustion turbine (CT) segment and the all units except CTs segment because, while some CTs provide regulation, they are very expensive to operate solely to provide regulation. In order to approximate the delivered price test approach, the Regulation Market HHI is reported with and without CTs. (See Table 3.) In the PJM Mid-Atlantic Region, HHIs are slightly lower without CTs because the CTs are disproportionately owned by the company with the largest market share.

**Table 3 PJM Mid-Atlantic Regulation Market hourly HHI (All units except CTs): Phases 4 and 5-a< 14_Graphs_Tables\PJMHHIResultsxls.xls (Tab NO_CTs) >**

| | Minimum | Average | Maximum | Percent Hours > 2500 |
|---|---|---|---|---|
| Offered | 1078 | 1475 | 2354 | 0% |
| Eligible | 1183 | 1718 | 2941 | 0% |
| Assigned | 1118 | 2266 | 9690 | 31% |

During Phases 4 and 5-a, two suppliers had market shares greater than, or equal to, 20 percent based on regulation offered and eligible. For the market segment excluding CTs, two suppliers had market shares greater than, or equal to, 20 percent based on regulation offered and eligible.

During Phases 4 and 5-a, 7 percent of the hours failed the single pivotal supplier test for offered and eligible supply in the PJM Mid-Atlantic Market.[17] This means that, during the seven-month period, for 7 percent of the hours the total regulation requirement could not be met in the absence of the largest supplier. Forty-eight percent of the hours failed the two pivotal supplier test. This means that, during 48 percent of the hours, the total regulation requirement could not be met in the absence of the two largest suppliers. Eighty-eight percent of the hours failed the three pivotal supplier test. This means that,

[17] The pivotal supplier results are provided for all offered regulation as additional information although these results are not directly relevant to the market structure analysis.

during 88 percent of the hours, the total regulation the regulation requirement could not be met in the absence of the three largest suppliers.

For the market segment excluding CTs, the percentage of one pivotal supplier hours in the eligible Regulation Market increases from 7 percent to 10 percent, the percentage of two pivotal supplier hours increases from 48 percent to 52 percent and the percentage of three pivotal supplier hours increases from 88 percent to 89 percent. Table 0-4 summarizes the PJM Mid-Atlantic Regulation Market pivotal supplier statistics for Phases 4 and 5-a. The pivotal supplier statistics are also presented for all regulating units except CTs. (See Table 5.) Three companies are pivotal more than 75 percent of the three pivotal supplier intervals for all units, and for the all units except CTs segment.

**Table 0-4 PJM Mid-Atlantic Region Regulation Market pivotal supplier statistics: Phases 4 and 5-a< 14_Graphs_Tables\Piv Sup Tables.xls (Tab PJM PivSup) >**

| | Hours Offered (Percent) | Hours Eligible (Percent) |
|---|---|---|
| 1 pivotal | 0% | 7% |
| 2 pivotal | 3% | 48% |
| 3 pivotal | 35% | 88% |

**Table 5 PJM Mid-Atlantic Region Regulation Market pivotal supplier statistics (All units except CTs): Phases 4 and 5-a< 14_Graphs_Tables\PJMPivSupResultsxls.xls (Tab NonCTPivSupHours) >**

| | Hours Offered (Percent) | Hours Eligible (Percent) |
|---|---|---|
| 1 pivotal | 0% | 10% |
| 2 pivotal | 9% | 52% |
| 3 pivotal | 52% | 89% |

Based on these market structure results, the MMU concludes that the market structure of the PJM Mid-Atlantic Region's Regulation Market during Phases 4 and 5-a can no longer be considered to be consistent with a competitive outcome. The combination of two market participants with market shares greater than, or equal to, 20 percent and the pivotal supplier results are not consistent with a competitive structure. The market in the PJM Mid-Atlantic Region was operated by PJM as a competitive market prior to the Combined Regulation Market.

### *Western Region Regulation Market – Phases 4 and 5-a*

During Phases 4 and 5-a, in the Western Region Regulation Market, the submitted offer capability was 2,267 MW. The level of resources offered on an hourly level and the level of regulation resources both offered and eligible to participate on an hourly level in the Regulation Market were lower than the submitted regulation offer capability. Between the beginning of Phase 4 and the end of Phase 5-a, the average hourly offer level was 938 MW or 41 percent of the submitted capability, while the average hourly eligible offer level was 847 MW or 37 percent of the submitted capability.

The ratio of the hourly regulation supply offered to the hourly regulation requirement, averaged 1.81 for the Phases 4 and 5-a Western Region Regulation Market. Based upon regulation offered and eligible, this ratio averaged 1.64. The average regulation requirement for the Phases 4 and 5-a Western Region Regulation Market was 517 MW.[18]

Hourly HHI values were calculated based upon the regulation offered, regulation offered and eligible and regulation assigned. Based upon regulation offered, HHI ranged from a maximum of 4357 to a minimum of 1748 with an average value of 2730. Fifty-eight percent of hours had an offered regulation HHI above 2500. Based upon regulation offered and eligible, HHI values ranged from a maximum of 4810 to a minimum HHI of 1757, with an average value of 2802. Fifty-eight percent of hours had an eligible regulation HHI above 2500. Based upon regulation assigned, HHI values ranged from a maximum of 7162 to a minimum HHI of 1698. The average HHI value for regulation assigned was 2973. Sixty-four percent of hours had an assigned regulation HHI above 2500. Table 0-6 summarizes the January 2005 through July Western Region Regulation Market HHIs.

**Table 0-6 Western Region Regulation Market hourly HHI: Phases 4 and 5-a <14_Graphs_Tables\HHI Tables.xls (Tab WRM HHIs) >**

| | Minimum | Average | Maximum | Percent Hours > 2500 |
|---|---|---|---|---|
| Offered | 1748 | 2730 | 4357 | 58% |
| Eligible | 1757 | 2802 | 4810 | 58% |
| Assigned | 1698 | 2973 | 7162 | 64% |

For the market segment excluding CTs, HHIs in the Western Region Regulation Market are somewhat higher. (See Table 7.)

18 See Appendix F, "Ancillary Service Markets," for additional detail on the regulation requirements.

**Table 7 Western Region Regulation Market hourly HHI (All units except CTs): Phases 4 and 5-a< 14_Graphs_Tables\WRMHHIResultsxls.xls (Tab NO_CTs) >**

| | Minimum | Average | Maximum | Percent Hours > 2500 |
|---|---|---|---|---|
| **Offered** | 1859 | 2960 | 4973 | 60% |
| **Eligible** | 1856 | 3029 | 5249 | 62% |
| **Assigned** | 1738 | 2984 | 7162 | 65% |

During Phases 4 and 5-a, one supplier had a market share greater than, or equal to, 20 percent based on offered and eligible regulation. For the market segment excluding CTs, one supplier had a market share greater than, or equal to, 20 percent based on offered and eligible regulation.

During Phases 4 through 5-a, 62 percent of the hours failed the single pivotal supplier test for offered and eligible supply in the Western Region Regulation Market. This means that, during the seven-month period, the total regulation requirement could not be met for 62 percent of the hours in the absence of the largest supplier. One-hundred percent of the hours failed the two pivotal supplier test. This means that, during 100 percent of the hours, the total regulation requirement could not be met in the absence of the two largest suppliers. One-hundred percent of the hours failed the three pivotal supplier test. This means that, during 100 percent of the hours, the total regulation requirement could not be met in the absence of the three largest suppliers. Table 0-8 summarizes the Western Region Regulation Market pivotal supplier statistics for Phases 4 through 5-a..

**Table 0-8 Western Region Regulation Market pivotal supplier statistics: Phases 4 and 5-a .<14_Graphs_Tables\RSI Tables.xls (Tab WRM PivSup)>**

| | Hours Offered (Percent) | Hours Eligible (Percent) |
|---|---|---|
| **1 pivotal** | 30% | 62% |
| **2 pivotal** | 100% | 100% |
| **3 pivotal** | 100% | 100% |

Table 9 presents pivotal supplier statistics for the Western Region regulation pool for all units except CTs. Eighty-eight percent of hours fail the one pivotal supplier test. In both the all units and all units except CTs market segments the same company that was the one pivotal supplier was also pivotal for more than 95 percent of the hours in which two and three suppliers were pivotal.

**Table 9 Western Region Regulation Market pivotal supplier statistics (All units except CTs:): Phases 4 and 5-a .<14_Graphs_Tables\WRMPivSupResultsxls.xls (Tab NonCTPivSupHours)>**

| | Hours Offered (Percent) | Hours Eligible (Percent) |
|---|---|---|
| 1 pivotal | 69% | 88% |
| 2 pivotal | 100% | 100% |
| 3 pivotal | 100% | 100% |

Based on these market structure results, the MMU concludes that the market structure of the Western Region Regulation Market was not consistent with a competitive outcome. The Regulation Market in the Western Region was operated by PJM, with the two dominant suppliers offer capped, as a market with market-clearing prices during Phases 4 and 5-a.

### *PJM Combined Regulation Market – Phase 5-b*

The PJM Combined Regulation Market during Phase 5-b was comprised of the PJM Western Region (the ComEd, AEP, DAY, Dominion, DLCO and AP Control Zones) and the PJM Mid-Atlantic Region. For the Phase 5-b PJM Combined Regulation Market, the submitted capability was 5,491 MW. The average hourly offer level was 2,370 MW while the average hourly eligible offer level was 1,841 MW.

The ratio of the hourly regulation supply offered to the hourly regulation requirement averaged 2.42. Based upon regulation offered and eligible, this ratio averaged 1.88. The average regulation requirement for the Phase 5-b PJM Combined Regulation Market was 978 MW.

Hourly HHI values were calculated based upon the regulation offered, regulation offered and eligible and regulation assigned. Based upon regulation offered, HHI ranged from a maximum of 1331 to a minimum of 812 with an average value of 1001. Based upon regulation offered and eligible, HHI ranged from a maximum of 1562 to a minimum HHI of 866, with an average value of 1079. Based upon regulation assigned, HHI values ranged from a maximum of 2390 to a minimum of 878. The average HHI value for regulation assigned was 1299. Table 0-10 summarizes HHI results for the PJM Combined Regulation Market.

**Table 0-10 PJM Combined Regulation Market HHI: Phase 5-b**
**<<14_Graphs_Tables\HHI Tables.xls (Tab RTO HHIs)>>**

| | Minimum | Average | Maximum | Percent Hours > 2500 |
|---|---|---|---|---|
| **Offered** | 812 | 1001 | 1331 | 0 |
| **Eligible** | 866 | 1079 | 1562 | 0 |
| **Assigned** | 878 | 1299 | 2390 | 0 |

For the market segment excluding CTs, HHIs are essentially the same (Table 11).

**Table 11 PJM Combined Regulation Market HHI (All units except CTs): Phase 5-b< 14_Graphs_Tables\RTOHHIResultsxls.xls (Tab NO_CTs) >**

| | Minimum | Average | Maximum | Percent Hours > 2500 |
|---|---|---|---|---|
| **Offered** | 845 | 1016 | 1417 | 0 |
| **Eligible** | 891 | 1080 | 1659 | 0 |
| **Assigned** | 878 | 1301 | 2400 | 0 |

During Phase 5-b, in the PJM Combined Regulation Market, no suppliers had a market share greater than, or equal to, 20 percent for regulation offered and eligible. For the market segment excluding CTs, no suppliers had a market share greater than, or equal to, 20 percent for regulation offered and eligible. For the CT market segment, two suppliers had market shares in excess of 20 percent for regulation offered and eligible.

During Phase 5-b, 1 percent of the hours failed the single pivotal supplier test for offered and eligible supply in the PJM Combined Regulation Market. This means that, during the five-month period, the total regulation requirement could not be met for 1 percent of the hours in the absence of the largest supplier. Six percent of the hours failed the two pivotal supplier test. This means that, during 6 percent of the hours, the total regulation requirement could not be met in the absence of the two largest suppliers. Twenty-nine percent of the hours failed the three pivotal supplier test. This means that, during 29 percent of the hours, the total regulation requirement could not be met in the absence of the three largest suppliers. Table 0-12 summarizes the PJM Combined Regulation Market's pivotal supplier results for Phase 5-b. For all units including CTs the same company that was the one pivotal supplier for more than one third of the one pivotal supplier intervals was also pivotal for more than 75 percent of the two pivotal supplier intervals and more than 80 percent of the hours in which two and three suppliers were pivotal. A second company was pivotal during more than 25 percent of the two pivotal and approximately 50 percent of three pivotal hours.

**Table 0-12 PJM Combined Regulation Market pivotal supplier statistics: Phase 5-b <<<14_Graphs_Tables\PivSup Tables.xls (Tab RTO PivSup)>>**

| | Hours Offered (Percent) | Hours Eligible (Percent) |
|---|---|---|
| 1 pivotal | 0% | 1% |
| 2 pivotal | 0% | 6% |
| 3 pivotal | 1% | 29% |

Table 13 presents pivotal supplier statistics for the PJM Combined Regulation market segment for all units except CTs.

**Table 13 PJM Combined Regulation Market pivotal supplier statistics (All units except CTs): Phase 5-b <<<14_Graphs_Tables\RTOPivSupResultsxls.xls (Tab NonCTPivSupHours)>>**

| | Hours Offered (Percent) | Hours Eligible (Percent) |
|---|---|---|
| 1 pivotal | 0% | 5% |
| 2 pivotal | 1% | 23% |
| 3 pivotal | 14% | 68% |

For the market segment excluding CTs, the percentage of one pivotal supplier hours in the eligible Regulation Market increases from 1 percent to 5 percent, the percentage of two pivotal supplier hours increases from 6 percent to 23 percent and the percentage of three pivotal supplier hours increases from 29 percent to 68 percent. (Table 13) In the all units except CTs market segment the same company that was the one pivotal supplier for more than two thirds of the one pivotal supplier intervals was also pivotal for more than 80 percent of the two pivotal supplier intervals and more than 95 percent of the hours in which two and three suppliers were pivotal. A second company is pivotal during more than 60 percent of the two pivotal and three pivotal hours, while the third pivotal position is shared by three companies with an approximately equal frequency of occurrence.

Based on this analysis, the MMU recommends that PJM continue to operate the Regulation Market as a single Combined Regulation Market. This recommendation is based on improved operational results and on the increased competitiveness of the Combined Market. Nonetheless, based on these market structure results, the MMU concludes that the market structure of the PJM Combined Regulation Market was not consistent with a competitive outcome. For Phase 5-b, the PJM Combined Regulation Market was operated by PJM, with the two dominant suppliers offer capped, as a price-based market with market-clearing prices. It would be reasonable, consistent with the results of the analysis and with FERC's actions regarding the Western Region Regulation

Market, to offer cap only the two dominant market participants identified in the analysis of the Combined Regulation Market. These results are based on the first five months of operation of the combined market. The MMU will continue to analyze market outcomes and market structure for the Combined Regulation Market.

## Regulation Market Conduct

## Regulation Offers

Generators wishing to participate in any of the PJM Regulation Markets must submit regulation offers for specific units by hour 1800 EPT of the day before the operating day. The regulation offer price is subject to a $100 per MWh offer cap in PJM control zones with the exception of the dominant suppliers Dominion and AEP whose offers are capped at marginal cost plus $7.50 per MWh plus opportunity cost. In the PJM Western Region during Phase 4, all regulation offers were capped at $7.50 per MWh plus the cost of providing regulation service because that market was determined to be not structurally competitive. As in any competitive market, regulation offers at marginal cost are considered to be competitive. In PJM, a $7.50 per MWh adder is considered to be consistent with competitive offers based on an analysis of historical offer behavior.

The offer price is the only component of the regulation offer applicable for the entire operating day. The following information must be included in each offer, but can be entered or changed up to 60 minutes prior to the operating hour: regulating status (available, unavailable or self-scheduled); regulation capability; and high and low regulation limits. The Regulation Market is cleared on a real-time basis, and regulation prices are posted hourly throughout the operating day. The amount of self-scheduled regulation is confirmed 60 minutes before each operating hour, and regulation assignments are made 30 minutes before each operating hour.

PJM's Regulation Markets are cleared hourly, based upon both offers submitted by the units and the hourly opportunity cost of each unit.[19] The effective offer price is the sum of the unit-specific offer and the opportunity cost. In order to clear the market, PJM ranks units which offer and are eligible to regulate by effective offer price and selects the lowest offers in order until the amount of regulation required for the hour is satisfied at least cost. The price that results is the regulation market-clearing price (RMCP), and the unit that sets this price is the marginal unit.

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19 PJM estimates the opportunity cost for units providing regulation based on a forecast of locational marginal price (LMP) for the upcoming hour. Opportunity cost is included in the market-clearing price.

## Regulation Market Performance

## Regulation Prices

Figure 0-2 shows both the daily average regulation market-clearing price and the opportunity cost component for the marginal units in the PJM Mid-Atlantic Region during Phases 4 and 5-a. Figure 0-3 shows the same data for the Western Region Regulation Market during Phases 4 and 5-a. Figure 0-4 shows the same data for the PJM Combined Regulation Market during Phase 5-b. All units chosen to provide regulation during Phases 4 and 5 received as payment the higher of the clearing price multiplied by the unit's assigned regulating capability, or the unit's regulation bid multiplied by its assigned regulating capability plus the individual unit's real-time opportunity cost.[20]

Regulation credits are awarded to generation owners that have either self-scheduled regulation or sold regulation into the market. Regulation credits for units self-scheduled to provide regulation are equal to the RMCP times the unit's self-scheduled regulating capability. Regulation credits for units that offered regulation into the market and were selected to provide regulation are the higher of the RMCP times the unit's assigned regulating capability, or the unit's regulation bid times its assigned regulating capability plus the opportunity cost that unit incurred. Although most units are paid RMCP times their assigned regulation MW, the RMCP is itself strongly dependent on the lost opportunity cost based upon forecast LMP calculated for the marginal unit during market clearing. This means that the total cost of regulation is very strongly dependent upon lost opportunity cost, which is dependent upon forecast LMP. Figure 0-2, Figure 0-3 and Figure 0-4 graph the RMCP against the estimated lost opportunity cost of the marginal unit (calculated at market clearance, adjusted for real-time deviations in LMP, and averaged over the day). Most of the cost of regulation comes from the lost opportunity cost of the marginal unit. The rest of the RMCP is the unit's regulation offer. The average offer of the marginal unit for PJM Mid-Atlantic during Phases 4 and 5-a was $15.33. The average offer of the marginal unit for the Western Region Regulation Market during Phases 4 and 5-a was $8.66. The average offer of the marginal unit for the PJM Combined Regulation Market during Phase 5-b was $13.16. In the PJM Mid-Atlantic Regulation Market during Phases 4 and 5-a, marginal unit LOC averaged 57 percent of the RMCP. In the Western Region Regulation Market during Phases 4 and 5-a, marginal unit LOC averaged 76 percent of RMCP. In the PJM Combined Regulation Market during Phase 5-b, marginal unit LOC averaged 79 percent of RMCP.

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20 See "PJM Operating Agreement, Accounting, m28," Revision 27, Section 4, "Regulation Credits" (October 1, 2004), pp. 26-27. PJM uses estimated opportunity cost to clear the market and real-time opportunity cost to compensate generators that provide regulation and spinning. Real-time opportunity cost is calculated using real-time LMP.

**Figure 0-2 PJM Mid-Atlantic Region daily average regulation clearing price and adjusted estimated marginal unit opportunity cost: Phases 4 and 5-a** **<< H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Fig5_2_RMCP_LOC_graph_PJM_new.xls (tab: Graph)>>**

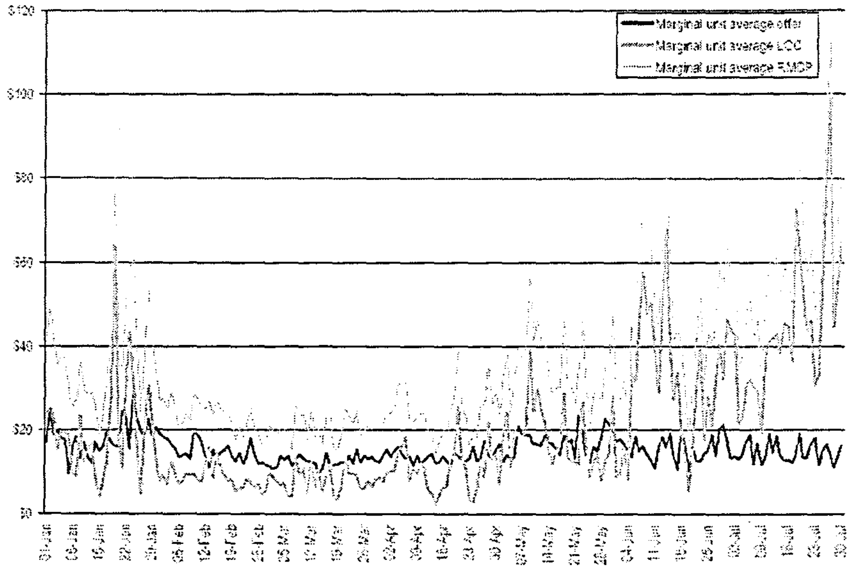


**Figure 0-3 Western Region daily average regulation clearing price and adjusted estimated marginal unit opportunity cost: Phases 4 and 5-a << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Fig5_3_RMCP_LOC_graph_WRM_new.xls (tab: Graph)>>**

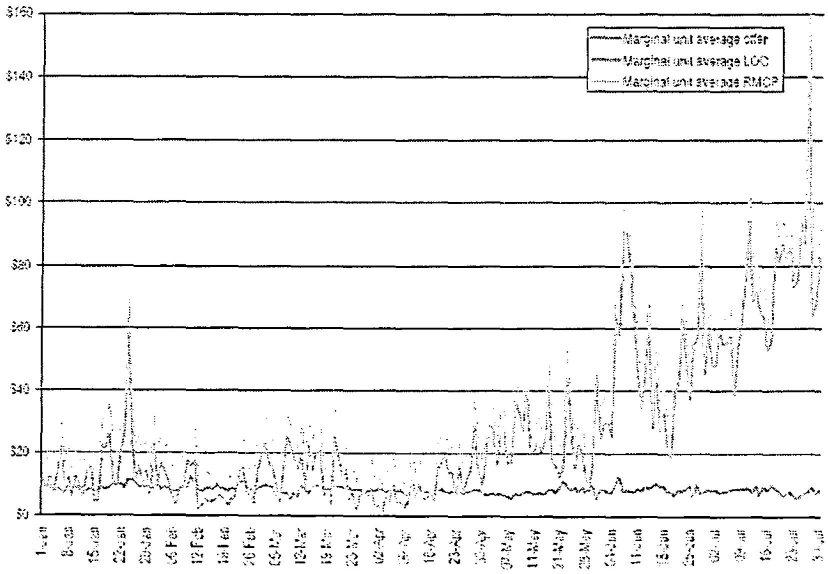


**Figure 0-4 PJM Combined Regulation Market daily average regulation clearing price and adjusted estimated marginal unit opportunity cost: Phase 5-b < H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Fig5_4_RMCP_LOC_graph_RTO_new.xls (tab: Graph)>**

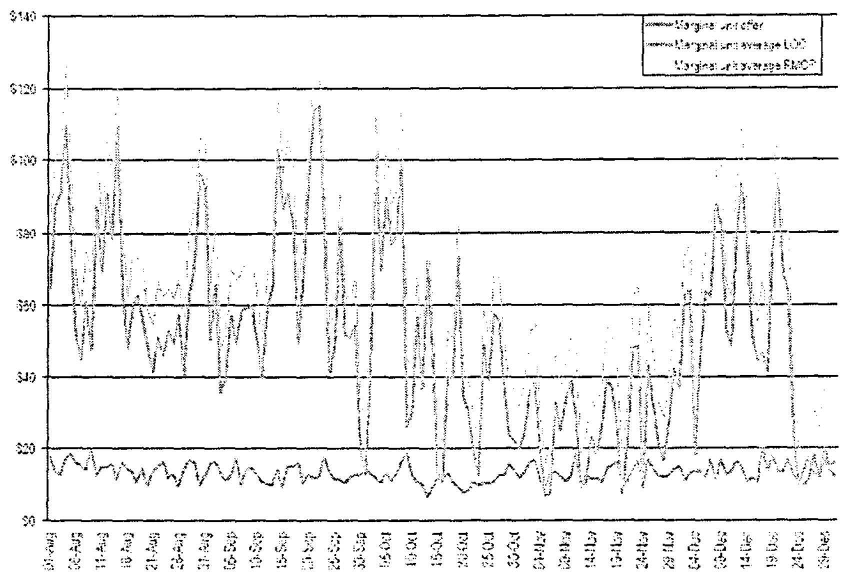



Figure 0-5, Figure 0-6 and Figure 0-7 compare the regulation price per MWh to the regulation MW purchased for each of the Regulation Markets. As the regulation requirement is a linear function of daily forecast peak load in all markets, all three graphs show that despite considerable daily variation, the price of regulation and the demand for regulation increase or decrease together on a seasonal scale. System LMP increases with load because higher priced units must be dispatched to meet demand and those increases in system LMP cause the opportunity cost to rise by increasing the spread between LMP and the energy offers of the regulating units.

**Figure 0-5 PJM Mid-Atlantic Region daily regulation MW purchased vs. price per MW: Phases 4 and 5-a <H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\RegMWPurch_vs_Price.xls (tab: PJMGraph)>>**

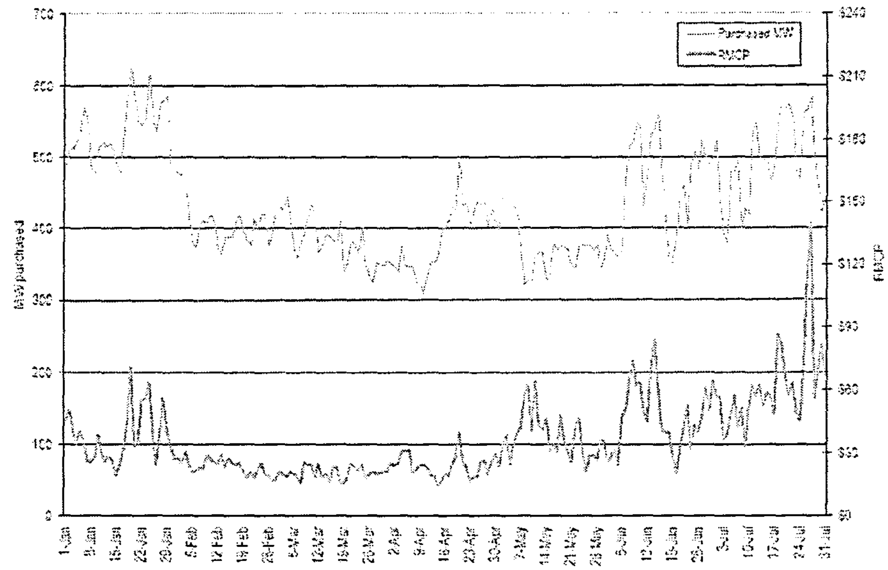



**Figure 0-6 Western Region daily regulation MW purchased vs. price per MW: Phases 4 and 5-a <H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\RegMWPurch_vs_Price.xls (tab: WRMGraph)>>**

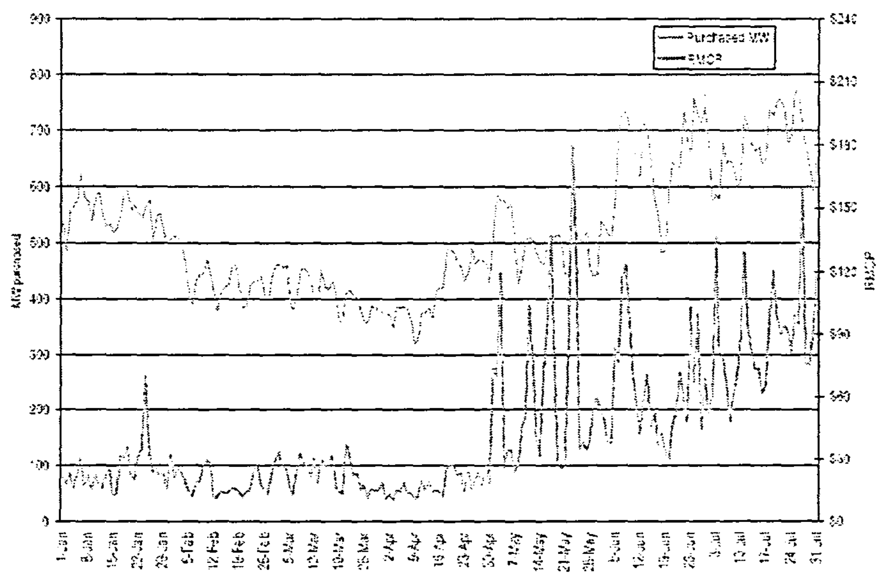
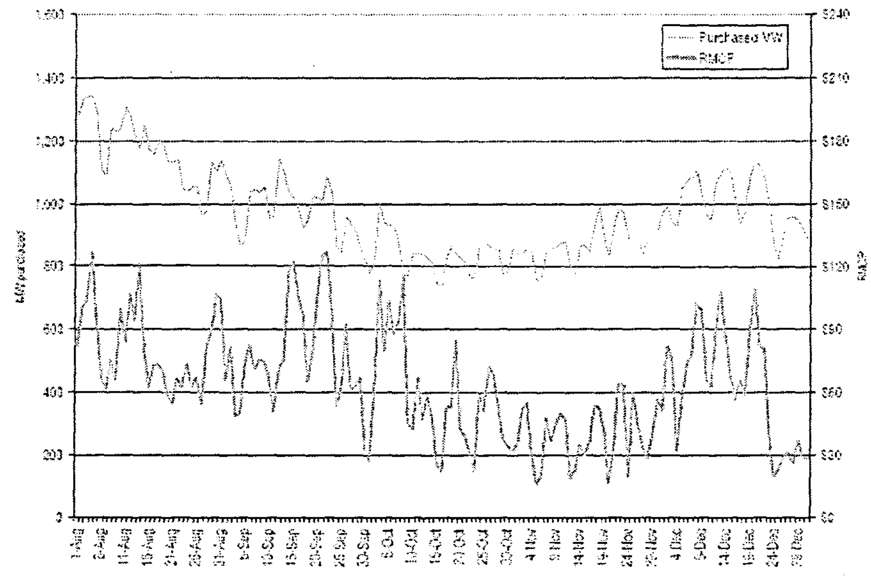


**Figure 0-7 PJM Combined Regulation Market daily regulation MW purchased vs. price per MW: Phase 5-b <H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\ RegMWPurch_vs_Price.xls (tab: RTOgraph)>>**



Important exceptions to this general pattern occurred periodically in the Western Region after the integration of Dominion on May 1, 2005. (See Figure 0-6.) An hourly analysis of regulation MW purchased versus the regulation price reveals some extreme exceptions that resulted from deficits during off-peak hours and/or times of minimum generation events. A shortage of regulation-capable units (as existed in the Western Region in early May) combined with a minimum generation event required expensive combustion turbine units to be started to satisfy regulation requirements resulting in high clearing prices. Minimum generation events can cause shortages of regulation in the PJM Mid-Atlantic Region as well, but since the regulation requirement in the PJM Mid-Atlantic Region is lower during off-peak hours it is less likely. Overall, the inflexibility of demand and the shortage of available regulating units caused relatively wide price swings in the Western Region during Phase 5-a.

As Figure 0-5, Figure 0-6 and Figure 0-7 also show, regulation prices during calendar year 2005 were seasonally higher in January, remained lower and relatively stable from February through April, then began to increase and show high daily variability into October before moderating at the end of the year. The higher average summer prices reflect higher LMPs in the lost opportunity cost (LOC) portion of the marginal unit's clearing price (RMCP) for regulation. (See Figure 0-2, Figure 0-3 and Figure 0-4.) During a period of low prices, March and April, the LOC/RMCP ratio was 42 percent for the PJM Mid-Atlantic Region and 58 percent for the Western Region. During a period of high prices, August and September, the LOC/RMCP ratio was 83 percent for the PJM Combined Regulation Market.

Figure 0-8 illustrates the level of demand for regulation by month in 2005 and the corresponding level of regulation cost.

**Figure 0-8 Monthly regulation MW and regulation cost per MW: Calendar year 2005 <J:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\CostPerMW_Monthly.xls (tab: graph)>**

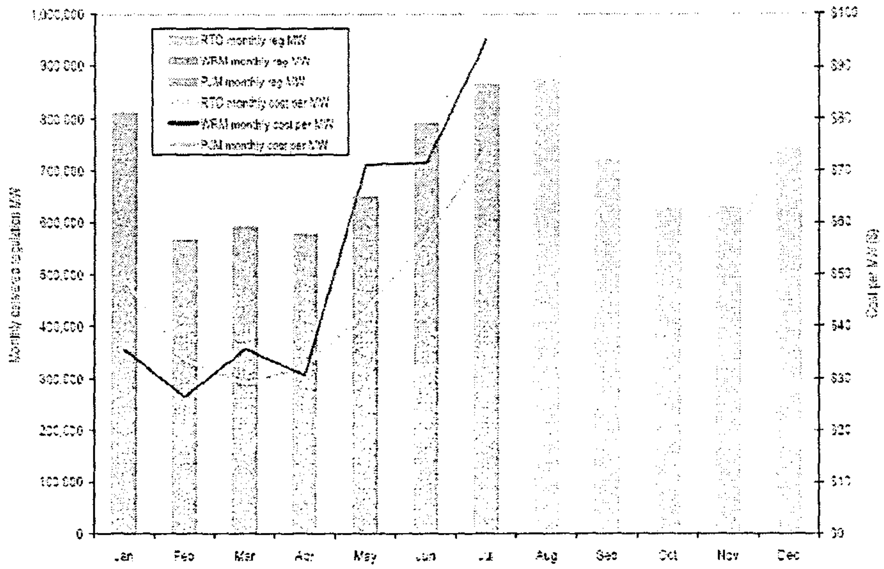
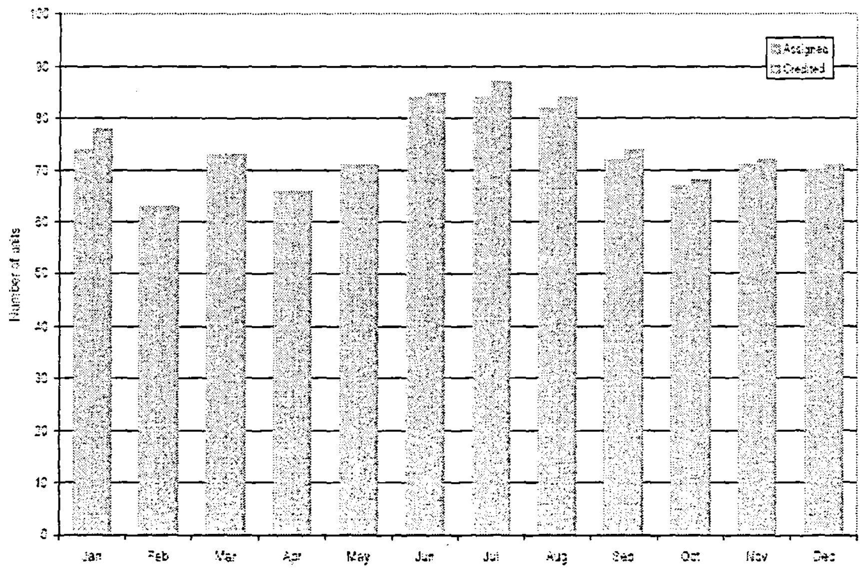



Figure 0-9 shows the average number of units per hour required to satisfy PJM's regulation requirement.

**Figure 0-9 Average hourly count of distinct units required to satisfy regulation requirement: Calendar year 2005 < J:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\UnitCount.xls (tab: UnitCountgraph)> >**




Units which provide regulation are paid the higher of the RMCP or their offer plus their unit-specific opportunity cost. In a perfect market all units would be compensated at RMCP times output. Sometimes, however, circumstances require that units be paid their offer plus their unit-specific opportunity cost. Examples include units that must be redispatched because of constraints, unanticipated performance problems, or changes in the real-time LMP and, therefore, opportunity cost from the value estimated at regulation market-clearing 30 minutes prior to the operating hour. For these reasons some units are paid the value of their offer plus their unit-specific lost opportunity costs when that sum is higher than the RMCP. This means that PJM's regulation cost per MWh is somewhat higher than the RMCP. Figure 0-10 and Figure 0-11 compare the regulation cost per MWh with the regulation clearing price to show the difference between the price of regulation and the total cost of regulation.

**Figure 0-10 PJM Western Region Regulation Market daily average RMCP vs. cost per MW for regulation: Phases 4 and 5-a <J:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\CostVsPrice.xls (tab: PJMWRMgraph)>**

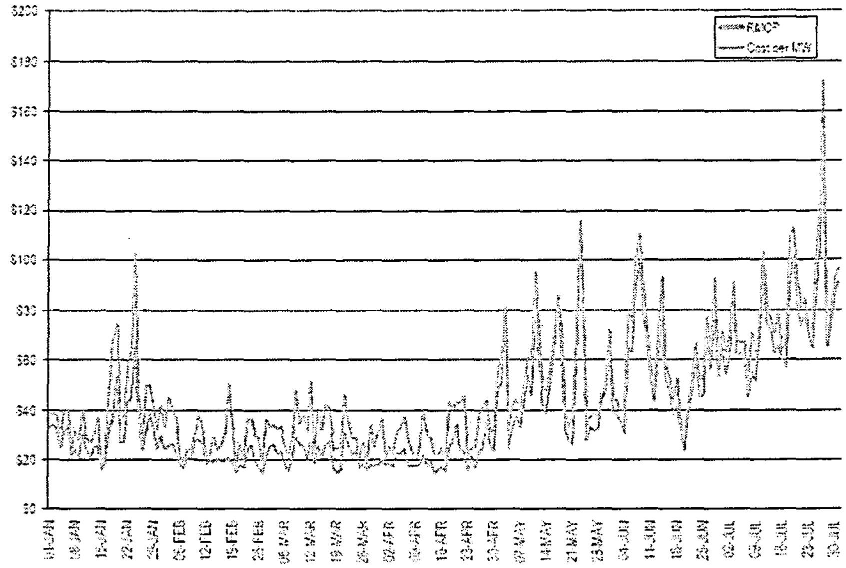
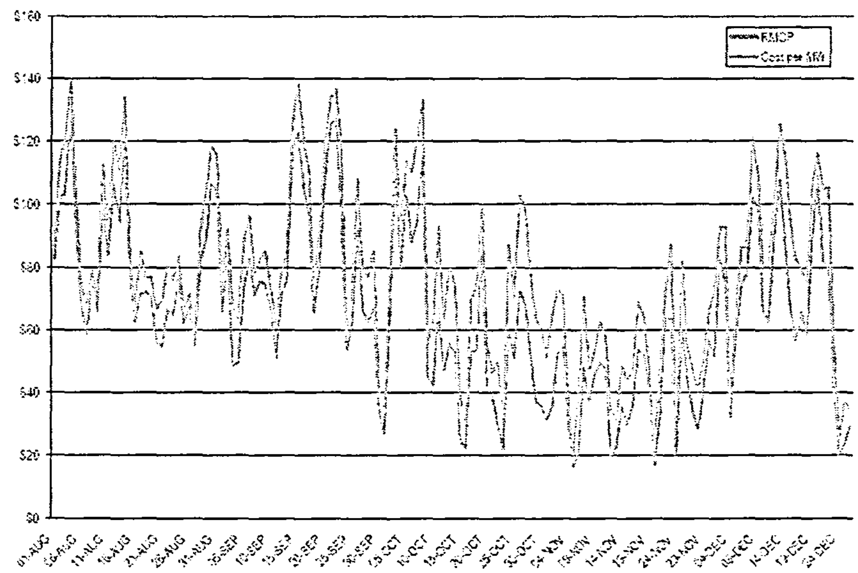


**Figure 0-11 PJM Combined Regulation Market daily average RMCP vs. cost per MW for regulation: Phase 5-b <J:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\CostVsPrice.xls (tab: RTOgraph)>**



## *Spinning Reserve Markets*

### Spinning Reserve Market Structure

The integration of Dominion on May 1, 2005 resulted in the creation of a Southern Region Spinning Reserve Market. Thus the PJM Spinning Reserve Markets include the PJM Mid-Atlantic Spinning Reserve Market, the Western Region Spinning Reserve Market, the ComEd Region Spinning Reserve Market and the Southern Region Spinning Reserve Market.

### Demand

Tier 2 spinning requirements are determined by subtracting the amount of forecast Tier 1 spinning reserve available from each spinning control area spinning reserve requirement for the period. The total spinning reserve requirement is different for each of the four regional Spinning Reserve Markets. For the Mid-Atlantic Region, the requirement is 75 percent of the largest contingency in the region, provided that 25 percent of the largest contingency is available as nonsynchronized, 10-minute reserve. For the ComEd Region, the requirement is 50 percent of the ComEd Control Zone's load ratio share of the largest contingency in NERC's Mid-America Interconnected Network, Inc. (MAIN) Region. From October 1 to December 3, 2004, this was 269 MW. After December 3, 2004, the ComEd Control Zone's spinning requirement was 216 MW. For the Western Region, the requirement is 1.5 percent of the daily peak-load forecast. For the Southern Spinning Reserve Zone, the requirement is the Dominion Control Zone's load ratio share of the largest system contingency within the Virginia and Carolinas Area (VACAR), minus the available 15-minute quick start capability within the Southern Spinning Reserve Zone.

Computed in accordance with the requirements above, the average MW spinning requirement was: 1091 MW, for the PJM Mid-Atlantic Region; 217 MW for the ComEd Spinning Zone; 437 MW for the Western Region; and 5 MW for the Southern Spinning Reserve Zone (May – December only).

**Figure 0-12 PJM Mid-Atlantic Spinning Region average hourly required spinning vs. Tier 2 spinning purchased: Calendar year 2005 <<H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Spinning Required vs Tier 2 Purchased.xls (tab: PJM)>>**

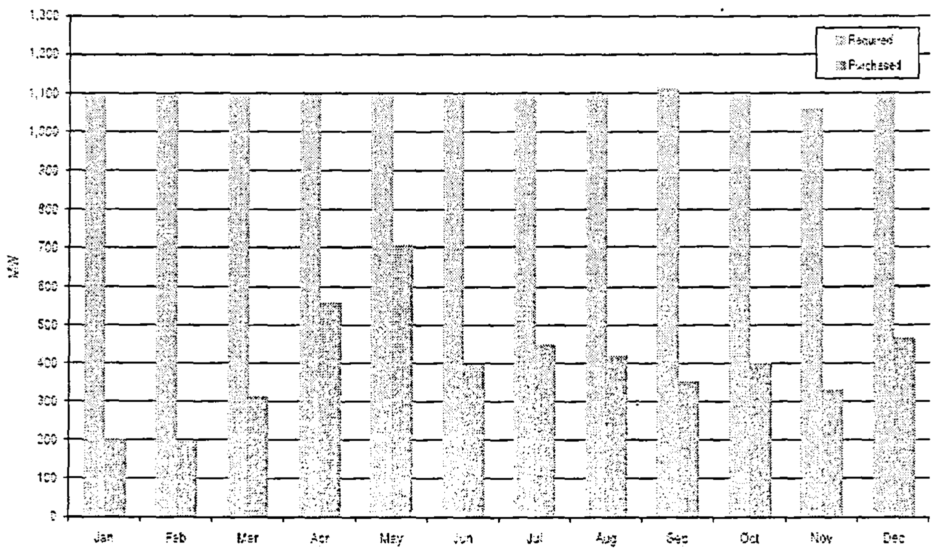


**Figure 0-13 ComEd Spinning Region average hourly required spinning vs. Tier 2 spinning purchased: Calendar year 2005 <H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Spinning Required vs Tier 2 Purchased.xls (tab: ComEd)>**

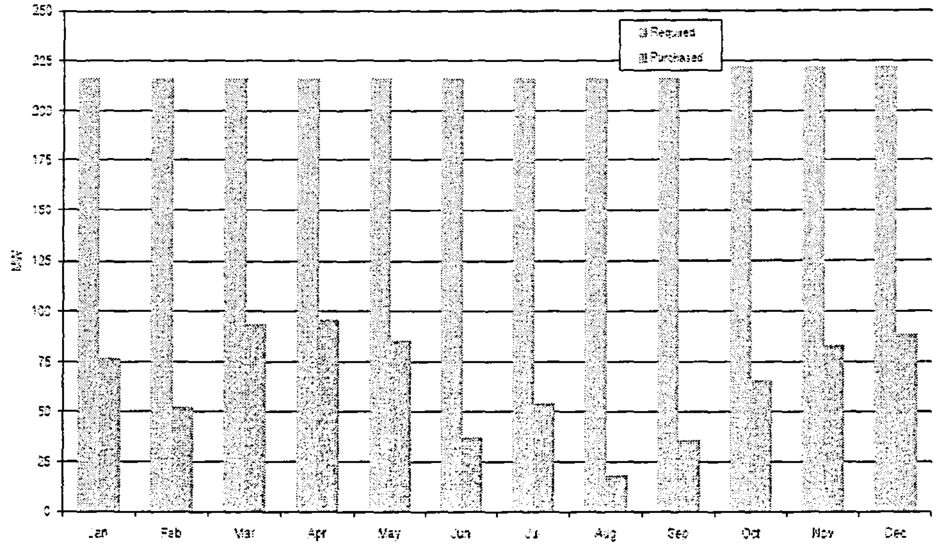
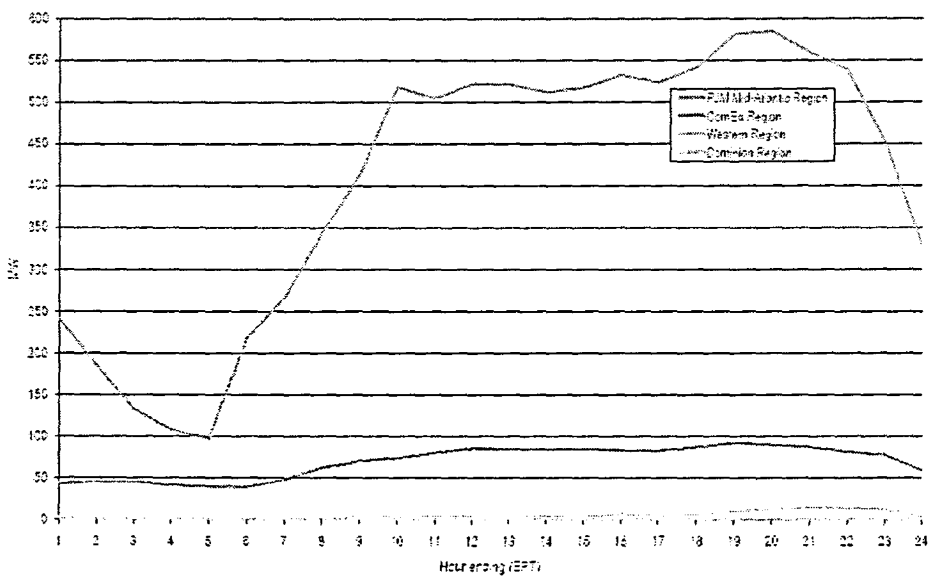


Figure 0-12 and Figure 0-13 show the average hourly spinning required and the average hourly Tier 2 spinning MW purchased during 2005 for the PJM Mid-Atlantic and ComEd Spinning Regions. Results for the Western Region Spinning Reserve Zone and the Southern Spinning Reserve Zone are not shown because Tier 2 spinning MW purchases were insignificant in those control areas during 2005. Spinning MW requirements are different for each of the four spinning regions in PJM. These differences are the result of specifications from local reliability councils, reserve-sharing arrangements with neighboring control areas and the types of generation available in the control area. The Southern Spinning Reserve Zone is a member of the VACAR subregion of SERC. VACAR specifies that available 15-minute quick start reserve can be subtracted from the largest contingency to determine spinning reserve requirements. The amount of 15-minute quick start reserve available in VACAR is sufficient to make Tier 2 spinning requirements zero for most hours. Similarly, in the Western Region Spinning Reserve Zone most of the required spinning reserve is available as Tier 1 from large, frequently running baseload units, reducing its Tier 2 spinning requirement to zero in most hours. In both the PJM Mid-Atlantic and ComEd Spinning Regions the spinning reserve requirement is a function of the largest contingency. For PJM Mid-Atlantic the hourly spinning requirement was usually 863 MW during off-peak hours and 1,150 MW during on-peak hours. Sometimes temporary grid conditions such as maintenance outages can cause double contingencies so there were times throughout the year when the on-peak spinning requirement was 1,380 MW. The average hourly Tier 2 spinning required for the PJM Mid-Atlantic Region was 1,091 MW. In the ComEd Region, the hourly requirement was 216 MW from January through September and 222 MW from October through December. Figure 0-12 and Figure 0-13 illustrate monthly average of the spinning reserve requirement and the amount of Tier 2 spinning actually purchased. The difference between the required spinning and Tier 2 spinning purchased is the amount of Tier 2 spinning available. Figure 0-14 illustrates the amount of Tier 2 spinning purchased by hour of the day. The hour variability reflects differing spinning reserve requirements for off-peak and on-peak hours as well as different amounts of Tier 1 spinning available.

**Figure 0-14 Average hourly Tier 2 spinning MW purchased by hour of day: Calendar year 2005 <<H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Spinning Tier 2 Credited Average MWs By Hour.xls (tab: graph)>>**




## Supply

Spinning reserve is an ancillary service defined as generation that is synchronized to the system and capable of producing output within 10 minutes. Spinning reserve can, at present, be provided by a number of sources, including steam units with available ramp, condensing hydroelectric units, condensing CTs and CTs running at minimum generation.

All of the units that participate in the Spinning Reserve Market are categorized as either Tier 1 or Tier 2 spinning. Tier 1 resources are those units that are online following economic dispatch and able to respond to a spinning event by ramping up from their present output. All units operating on the PJM system are considered potential Tier 1 resources, except for those explicitly assigned to Tier 2 spinning. Tier 2 resources include units that are backed down to provide spinning capability and condensing units synchronized to the system and available to increase output.

PJM introduced a market for spinning reserve on December 1, 2002. Before the Spinning Reserve Market, Tier 1 spinning reserve had not been compensated directly and Tier 2 spinning reserve had been compensated on a unit-specific, cost-based formula.

Under the Spinning Reserve Market rules, Tier 1 resources are paid when they respond to an identified spinning event as an incentive to respond when needed. Tier 1 spinning payments or credits are equal to the integrated increase in MW output above economic dispatch from each generator over the length of a spinning event, multiplied by the spinning energy premium less the hourly integrated LMP. The spinning energy premium is defined as the average of the five-minute LMPs calculated during the spinning event plus $50 per MWh.[21] All units called on to supply Tier 1 or Tier 2 spinning have their actual MW monitored. Tier 1 units are not penalized if their output fails to match their expected response as they are only compensated for their actual response. Tier 2 units assigned spinning by market operations are compensated whether or not they are actually called on to supply spinning so they are penalized if their MW output fails to meet their assignment.

There were significant changes to the geographic structure of PJM's Spinning Reserve Markets in 2005. In Phase 4, PJM had three Spinning Reserve Markets: the PJM Mid-Atlantic Spinning Reserve Zone, the Western Spinning Reserve Zone and the ComEd Spinning Reserve Zone. During Phase 4 the Western Spinning Reserve Zone was comprised of AP, AEP, DAY and DLCO Control Zones. In Phase 5, the Dominion Control Zone was integrated into PJM and became the Southern Spinning Reserve Zone. Dominion remained a separate Spinning Reserve Market because as a member of the Southeastern Electric Reliability Council (SERC) it has distinct spinning reserve requirements and reserve-sharing agreements.

Under the Spinning Reserve Market rules, Tier 2 spinning resources are paid to be available as spinning reserve, regardless of whether the units are called upon to generate in response to a spinning event and are subject to penalties if they do not provide spinning reserve when called. The price for Tier 2 spinning resources is determined in a market for Tier 2 spinning resources. Several steps are necessary before the hourly Tier 2 Spinning Reserve Market is cleared. Ninety minutes prior to the start of the hour, PJM

21 See "PJM Manual 11: Scheduling Operations," Revision 23 (December 7, 2004), pp. 66-67.

estimates the amount of Tier 1 reserve available from every unit; 60 minutes prior to the start of the hour, self-scheduled Tier 2 units are identified. If spinning requirements are not met by Tier 1 and self-scheduled Tier 2 resources, then a Tier 2 clearing price is determined 30 minutes prior to the start of the hour. This Tier 2 price is equivalent to the merit-order price of the highest price, Tier 2 resource needed to fulfill spinning requirements, the marginal unit.[22]

The spinning offer price submitted for a unit can be no greater than the unit's operating and maintenance cost plus a $7.50 per MWh margin.[23, 24] The market-clearing price is comprised of the marginal unit's spinning offer price, the cost of energy use and the unit's opportunity cost. All units cleared in the Spinning Reserve Market are paid the higher of either the market-clearing price or the unit's spinning offer plus the unit-specific LOC and/or the cost of energy use incurred.

The Mid-Atlantic Region, the Western Region, the ComEd Region, and the Southern Region Spinning Reserve Zones all operate under similar business rules. The Tier 2 Spinning Reserve Market in each of PJM's spinning reserve zones is cleared on cost-based offers because the structural conditions for competition do not exist. The structural issue can be more severe when the Spinning Reserve Market becomes local because of transmission constraints.

## Concentration of Ownership

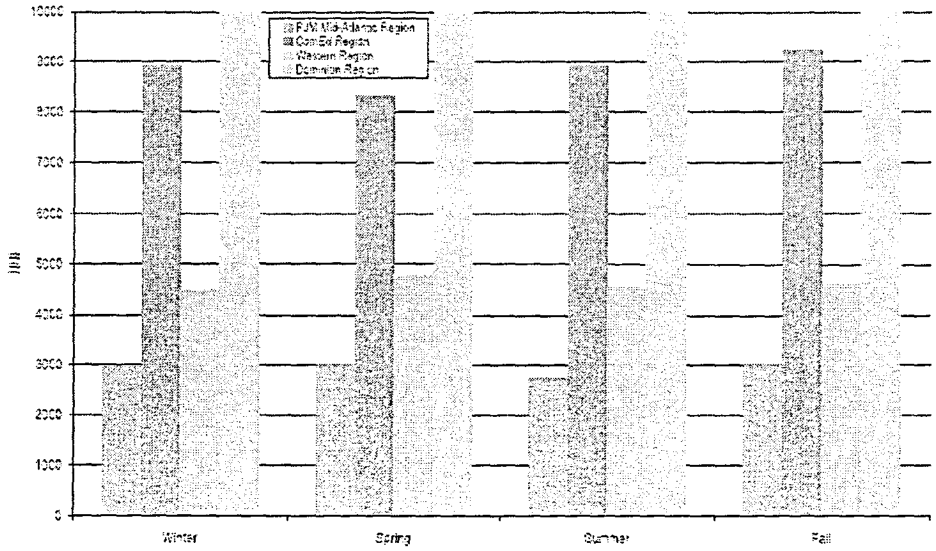
The offered and eligible Tier 2 Spinning Reserve Markets for all four geographic markets are highly concentrated. (See Figure 0-15.) During calendar year 2005, in the Mid-Atlantic Region average HHI for offered Tier 2 spinning was 2167 and 2940 for eligible spinning. In the ComEd Region during 2005 the average HHI for offered spinning was 6305 and 8844 for eligible spinning. In the Western Region the average HHI for offered spinning was 4173 and 4593 for eligible spinning. In the Southern Region the HHI was 10000.

22 Although it is unusual, a PJM dispatcher can deselect units which have been committed after the clearing price is established. This only happens if real-time system conditions require dispatch of a spinning unit for constraint control, or problems with a generator or monitoring equipment are reported.

23 See "PJM Manual 11: Scheduling Operations," Revision 23 (December 7, 2004), p. 58.

24 See PJM Manual 15: Cost Development Guidelines, Rev. 4, (September 1, 2004), p. 31.

**Figure 0-15 Eligible Spinning Reserve Market HHI: Calendar year 2005 << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Spinning Tier2 Eligible HHIs FCS.xls (tab:graph)>>**



## Spinning Reserve Market Performance

### Spinning Reserve Offers

Figure 0-16 shows the daily average hourly offered Tier 2 spinning. Figure 0-17 shows the daily average hourly eligible Tier 2 spinning. Daily Tier 2 spinning offers are fairly stable reflecting the Tier 2 spinning capability of the units, other unit attributes and economic decisions by sellers. The level of eligible spinning displays considerable variability because it is calculated hourly and reflects current market and grid conditions, including LMP, unit dispatch and system constraints.

Figure 0-16 Tier 2 Spinning Offered MW: Calendar year 2005 **<< H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Spinning Tier 2 Offered MWs and Offered $ per MWh Daily.xls (tab: Offered MW Graph>>**

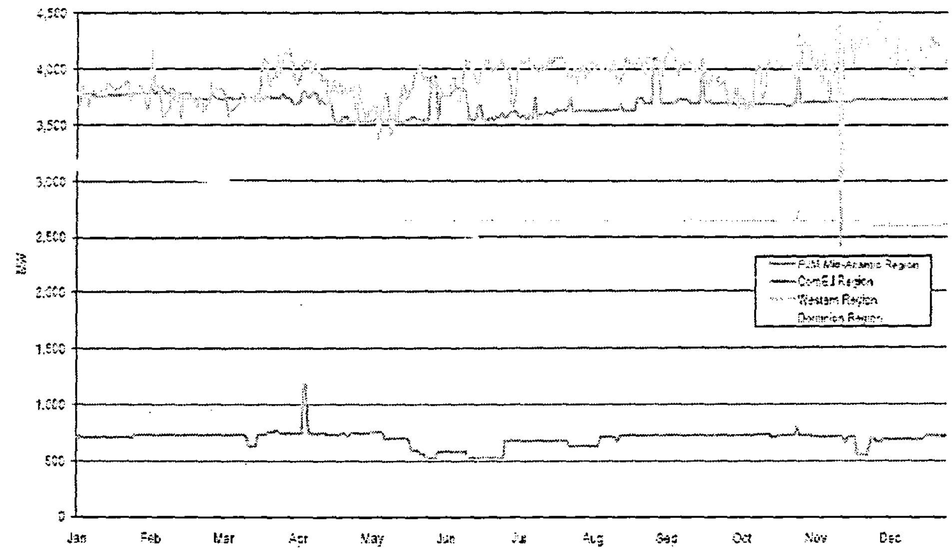



Figure 0-17 Tier 2 spinning eligible MW: Calendar year 2005 **<< H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\ Spinning Tier 2 Eligible MWs and Eligible $ per MWh Daily.xls>>**

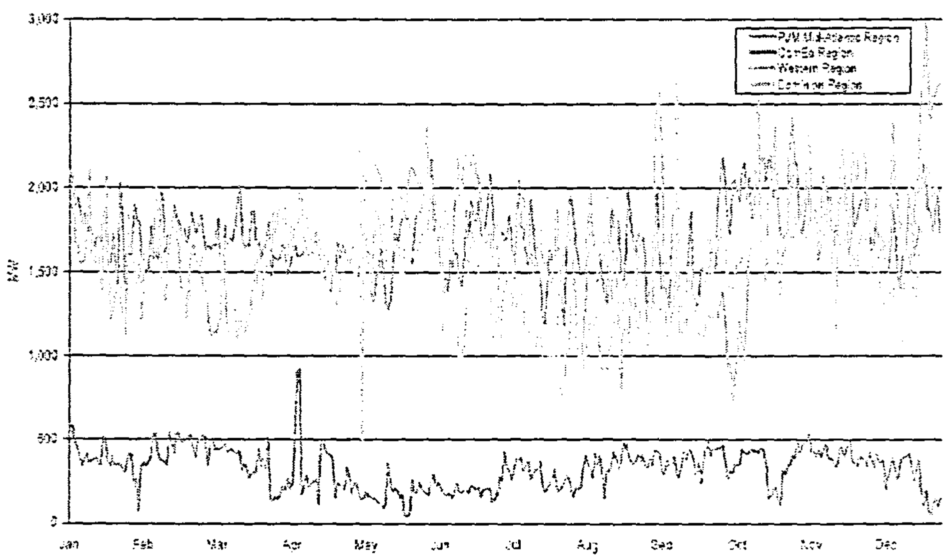
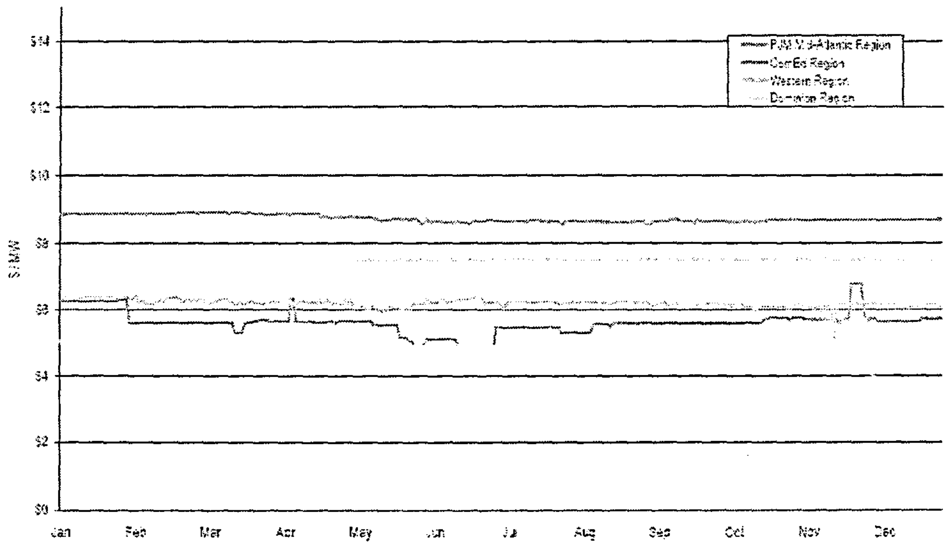


Figure 0-18 shows average offer price per MW by ancillary service area. Tier 2 spinning offers are capped at $7.50 plus costs. The clearing price for Tier 2 spinning includes lost opportunity costs based on LMP, energy use, and operating costs for units which are actually assigned Tier 2 spinning. (Figure 0-19)

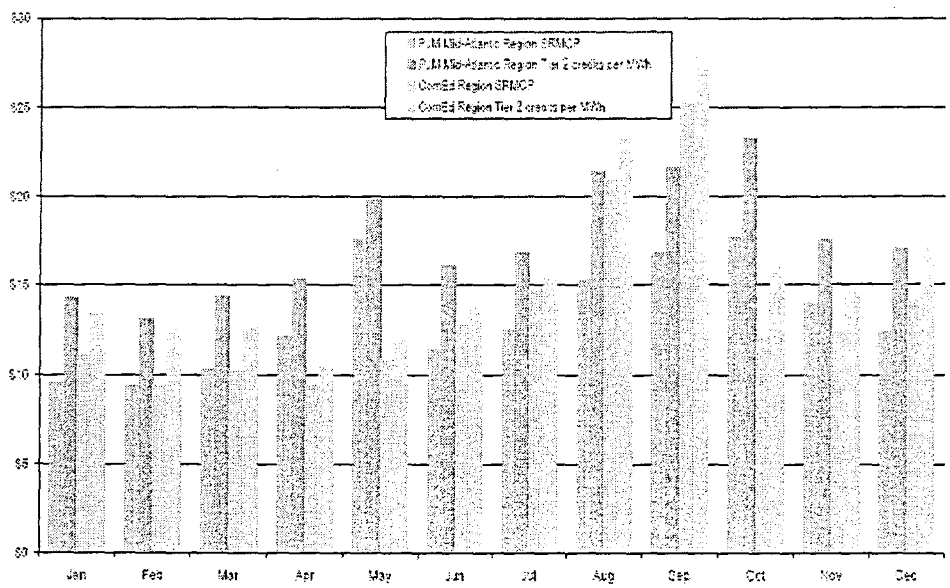
**Figure 0-18 Tier 2 spinning average offer price per MW: Calendar year 2005 << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\ Spinning Tier 2 Offered MWs and Offered $ per MWh Daily.xls (tab: Offered $ per MW graph>>**



## Spinning Reserve Prices

Figure 0-19 shows the average spinning reserve market-clearing price (SRMCP) and the cost per MW associated with meeting PJM demand for spinning reserve. The average PJM Mid-Atlantic Region SRMCP rose in 2005 to $13.29. The cost per MW of meeting the spinning reserve requirements also rose to approximately $17.59 per MWh. In the ComEd Region, the average SRMCP was $13.64 and the cost per MW for meeting the spinning reserve requirement was $15.85. No price data are presented for the Western Region Spinning Reserve Market because there was almost always adequate Tier 1 spinning reserve to meet the requirements for spinning reserve without clearing the Tier 2 market.

**Figure 0-19 Tier 2 spinning market-clearing price and cost per MW: Calendar year 2005 << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\ Spinning Tier 2 Credits Per MWh Daily Versus Average SRMCP.xls (tab: graph)>>**




The Western Region's Spinning Reserve Market (not shown in Figure 0-19) during 2005 almost never had a clearing price because available Tier 1 spinning was always sufficient to cover the spinning requirement. For the 311 hours between June and December when a Spinning Reserve Market was cleared in the Western Region, the average clearing price was $12.27 and the cost of spinning was $66.75 per MWh. The Southern Region (not shown in Figure 0-19) was cleared only 18 hours between June 1 and December 31 with an average SRMCP of $11.34 and an average cost per MWh for Tier 2 spinning of $35.10.

Like Regulation Market prices, Tier 2 spinning reserve prices are more reflective of costs associated with the marginal unit than they are of offer prices. Unlike regulation, however, the costs in Tier 2 spinning are more than just opportunity costs; they are also energy costs for condensing MWh (which must be purchased from the Real-Time Energy Market when the unit is spinning), and startup costs if the assigned unit is not already running. Figure 0-20 and Figure 0-21 shows the relationship between the marginal unit's offer price and the SRMCP. For PJM Mid-Atlantic during all of 2005 the Tier 2 Spinning offer price averaged 67 percent of the SRMCP.

**Figure 0-20 PJM Mid-Atlantic Tier 2 spinning reserve clearing prices and marginal unit offer price: Calendar year 2005 << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\ SpinPriceLOC_final.xls (tab: PJMPriceLOCgraph)>>**

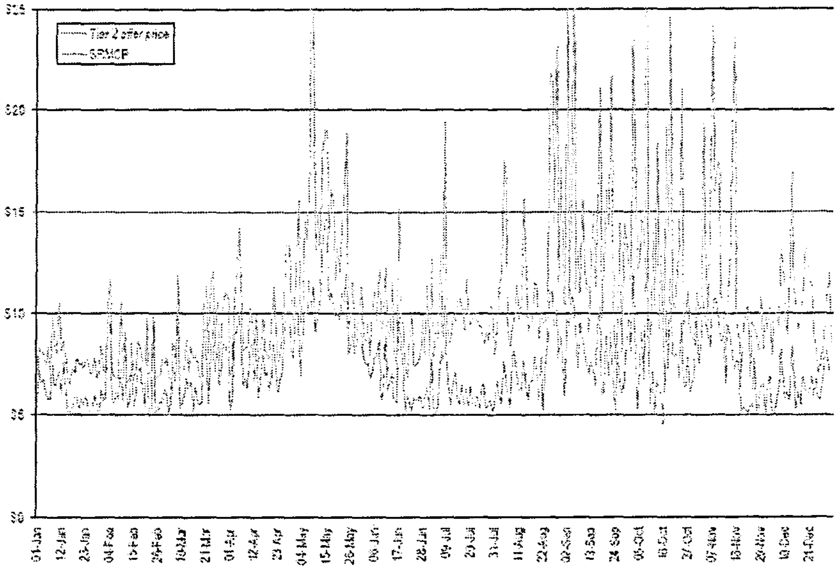



Figure 0-21 shows the relationship between the marginal units' offer price and the SRMCP for the ComEd Region. For the ComEd Region during all of 2005, the Tier 2 spinning offer price averaged 51 percent of the SRMCP.



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**Figure 0-21 ComEd Tier 2 spinning reserve clearing prices and marginal unit offer price: Calendar year 2005 << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\ SpinPriceLOC_final.xls (tab: ComEDPriceLOCgraph)>>**

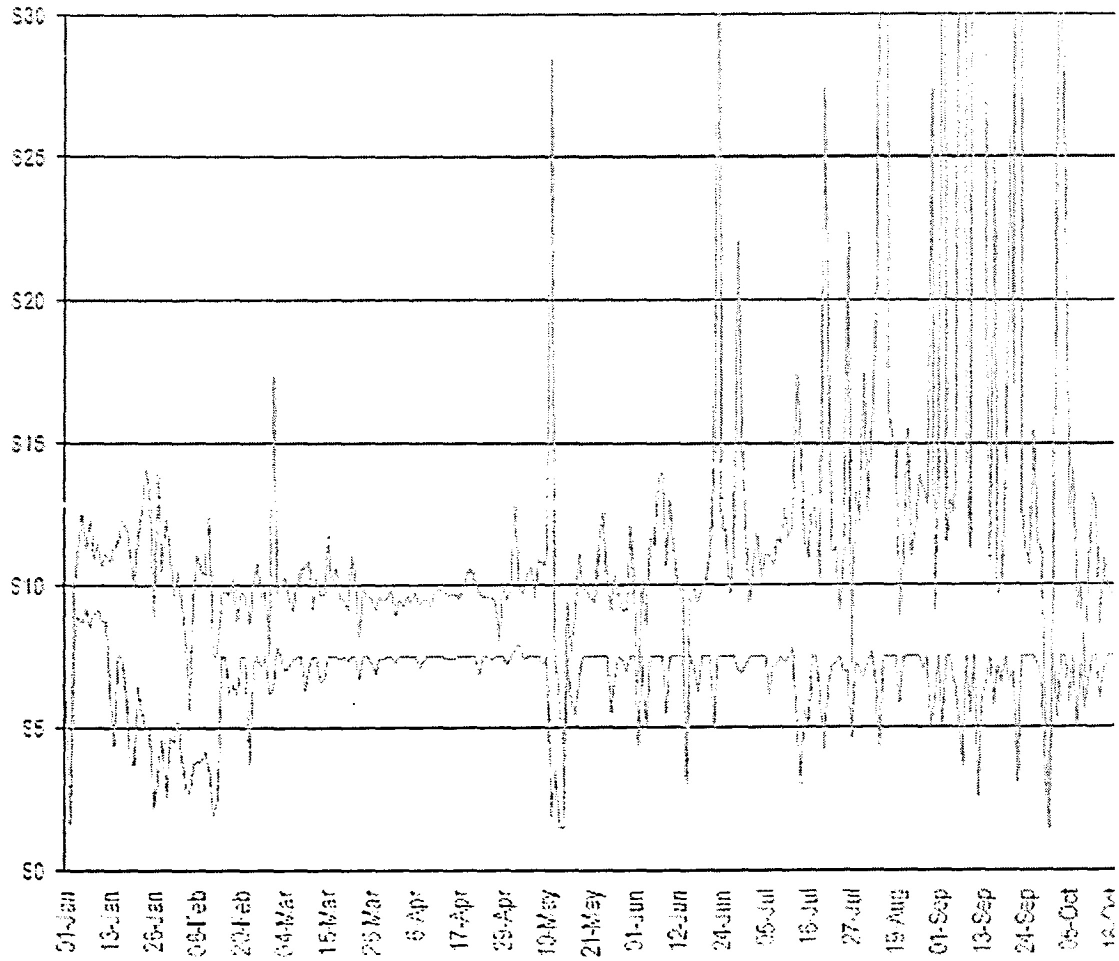
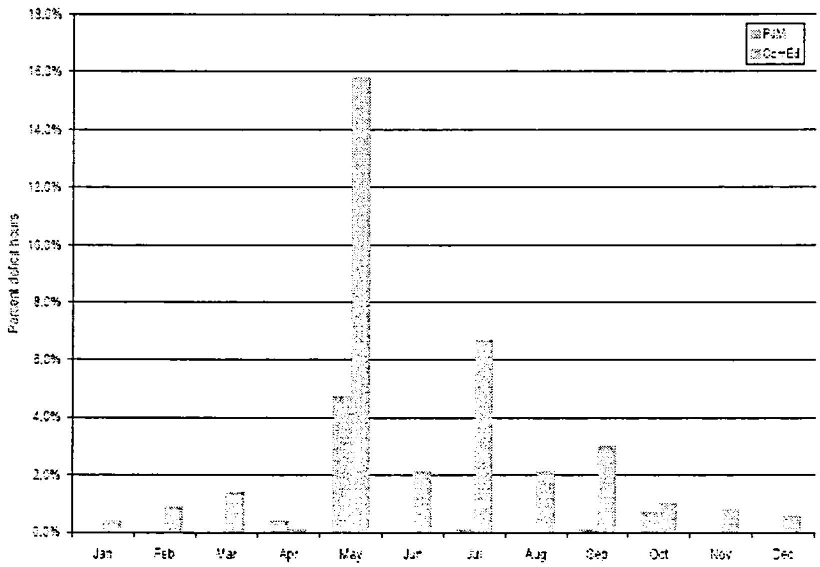



Figure 0-21 shows the level of Tier 1 and Tier 2 spinning reserve purchased from suppliers during calendar year 2005. Tier 1 resources are paid only if they respond during spinning events while Tier 2 resources are paid for providing hourly reserve. In general, more Tier 2 resources are purchased than Tier 1 resources, and Tier 2 payments are higher than Tier 1 payments. An important exception to this general rule was in the Western Region's Spinning Reserve Market where a large baseload of available operating reserves ensures that Tier 1 spinning reserve services were almost always sufficient to cover the spinning requirement so Tier 2 spinning reserve was rarely purchased.

## Spinning Reserve Availability

A spinning reserve deficit occurs when the combination of Tier 1 and Tier 2 spinning is not adequate to meet the spinning reserve requirement. Except for a brief period in the ComEd Region during May (See Figure 0-22.), none of PJM's Spinning Reserve Markets had significant spinning reserve deficits during 2005.

**Figure 0-22 Tier 2 Spinning Reserve Market deficits: Calendar year 2005 <<J:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\DeficitResults.xls (tab: DeficitResultsGraph)>>**




The Tier 2 spinning deficit peak during May in the ComEd Region was caused indirectly by a need for regulation and the assignment of several CTs, which otherwise provided spinning reserve to regulation. None of these Tier 2 spinning deficits created a serious problem because the ComEd Region's reserve requirement was satisfied by a reserve-sharing agreement with other members of MAIN.

## Ancillary Service Markets

The United States Federal Energy Regulatory Commission (FERC) defined six ancillary services in Order 888: 1) scheduling, system control and dispatch; 2) reactive supply and voltage control from generation services; 3) regulation and frequency response services; 4) energy imbalance service; 5) operating reserve -- spinning reserve services; and 6) operating reserve -- supplemental reserve services.[1] Of these, PJM currently provides regulation, energy imbalance and spinning reserve services through market-based mechanisms. PJM provides energy imbalance service through the Real-Time Energy Market. PJM provides the remaining ancillary services on a cost basis.

Regulation matches generation with very short-term changes in load by moving the output of selected generators up and down via an automatic control signal.[2] Regulation is provided, independent of economic signal, by generators with a short-term response capability (less than five minutes). Longer term deviations between system load and generation are met via primary and secondary reserves and generation responses to economic signals. Spinning reserve is a form of primary reserve. To provide spinning a generator must be synchronized to the system and capable of providing output within 10 minutes.

Both the Regulation and Spinning Reserve Markets are cleared on a real-time basis. A unit can be selected for either spinning reserve or regulation or neither, but it cannot be selected for both. The Regulation and Spinning Reserve Markets are cleared simultaneously and cooptimized with the Energy Market and operating reserve requirements to minimize the cost of the combined products.

PJM does not provide a market for reactive power, but does ensure its adequacy through member requirements and scheduling.[3] Generation owners are paid according to the FERC-approved reactive revenue requirements. Charges are allocated to network customers based on their percentage of load, as well as to point-to-point customers based on their monthly peak usage.

During the last two calendar years, PJM has integrated five control zones. In the *2004 State of the Market Report* the calendar year was divided into three phases, corresponding

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1 75 FERC ¶ 61,080 (1996).

2 Regulation is used to help control the area control error (ACE). See Appendix F, "Ancillary Service Markets," for a full definition and discussion of ACE.

3 See "PJM Manual for Scheduling Operations, M-11," Revision 25 (August 19, 2005), p. 71.

to market integration dates. In the *2005 State of the Market Report* the calendar year is divided into two phases, also corresponding to market integration dates:[4]

- **Phase 1 (2004).** The four-month period from January 1 through April 30, 2004, during which PJM was comprised of the Mid-Atlantic Region, including its 11 zones,[5] and the Allegheny Power Company (AP) Control Zone.[6]

- **Phase 2 (2004).** The five-month period from May 1 through September 30, 2004, during which PJM was comprised of the Mid-Atlantic Region, including its 11 zones, the AP Control Zone and the Commonwealth Edison Company Control Area (ComEd).[7]

- **Phase 3 (2004).** The three-month period from October 1 through December 31, 2004, during which PJM was comprised of the Mid-Atlantic Region, including its 11 zones, the AP Control Zone and the ComEd Control Zone plus the American Electric Power Control Zone (AEP) and The Dayton Power & Light Company Control Zone (DAY). The ComEd Control Area became the ComEd Control Zone on October 1.

- **Phase 4 (2005).** The four-month period from January 1 through April 30, 2005, during which PJM was comprised of the Mid-Atlantic Region, including its 11 zones, the AP, ComEd, AEP and DAY Control Zones plus the Duquesne Light Company (DLCO) Control Zone which was integrated into PJM on January 1, 2005.

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4 See the *2004 State of the Market Report* for more detailed descriptions of Phases 1, 2 and 3.

5 The Mid-Atlantic Region is comprised of the Atlantic Electric Company Control Zone (AECO), the Baltimore Gas & Electric Control Zone (BGE), the Delmarva Power & Light Control Zone (DPL), the Jersey Central Power & Light Company Control Zone (JCPL), the Metropolitan Edison Company Control Zone (Met-Ed), the PECO Energy Company Control Zone (PECO), the Pennsylvania Electric Company Control Zone (PENELEC), the Pepco Control Zone (PEPCO), the PPL Electric Utilities Corporation Control Zone (PPL), the Public Service Electric and Gas Company Control Zone (PSEG) and the Rockland Electric Company Control Zone (RECO).

6 Zones, control zones and control areas are geographic areas that customarily bear the name of a large utility service provider operating within their boundaries. Names apply to the geographic area, not to any single company. The geographic areas did not change with the formalization of the control zone and control area concepts during PJM's Phase 3 integrations. For simplicity, zones are referred to as control zones for all three phases. The only exception is ComEd which is called the ComEd Control Area for Phase 2 only.

7 During the five-month period May 1, 2004, through September 30, 2004, the ComEd Control Zone (ComEd) was called the Northern Illinois Control Area (NICA).

- **Phase 5 (2005).** The eight-month period from May 1 through December 31, 2005, during which PJM was comprised of the Phase 4 elements plus the Dominion Control Zone which was integrated into PJM on May 1, 2005.

In both Phase 4 and Phase 5, PJM operated two Regulation Markets: one for the Mid-Atlantic Region and a second for the Western Region. On August 1 of Phase 5, PJM combined both into a single PJM Combined Regulation Market for a six-month trial period. After the trial period, based on analysis of market results and a report by the PJM Market Monitoring Unit (MMU), PJM stakeholders will vote on whether to keep the combined market.

During Phase 4, PJM operated three Spinning Reserve Markets: one for the Mid-Atlantic Region, one for the Western Region and one for the ComEd Control Zone. During Phase 5, PJM operated a fourth Spinning Reserve Market for Dominion.

The analysis treats each of the two Regulation Markets and each of the three Spinning Reserve Markets separately during Phase 4. The market analysis treats each of the two Regulation Markets separately during the May 1 through July 31 component of Phase 5 (Phase 5-a), and as a single Regulation Market during the August 1 through December 31 component of Phase 5 (Phase 5-b). Each of the four Spinning Reserve Markets is treated separately for the entire Phase 5 period.

## *Overview – Regulation and Spinning Reserve Markets*

The MMU has reviewed structure, conduct and performance indicators for the identified Regulation Markets. The MMU concludes that the Regulation Markets functioned effectively, except for some minor problems of insufficient regulation supply shortly after the start of Phase 5 and during times of minimum generation. The Regulation Markets produced competitive results throughout calendar year 2005 based on the regulation market-clearing price. The Regulation Market prices reflected the fact that offers in the Western Region were capped during Phase 4 and that the offers of two large participants, AEP and Dominion, were capped at cost plus a margin throughout Phase 5, in both cases because the Western Region Regulation Market was determined to be not structurally competitive.

The MMU has reviewed structure, conduct and performance indicators for the identified Spinning Reserve Markets. The MMU concludes that the Spi nning Reserve Markets functioned effectively. The Spinning Reserve Markets produced competitive results throughout calendar year 2005 based on the spinning market-clearing price. The Spinning Reserve Market prices reflected the fact that all offers were capped at cost plus a margin because the markets have been determined to be not structurally competitive.

## The Regulation Markets

The structure of the Mid-Atlantic Region and Western Region Regulation Markets was evaluated and the MMU concluded that these markets are not structurally competitive as they are characterized by a combination of one or more structural elements including high levels of supplier concentration, high individual company market shares, significant hours with pivotal suppliers and inelastic demand. The structure of the Combined Regulation Market was also evaluated based on the five months of available data and the MMU concluded that this market is characterized by lower levels of concentration, smaller market shares, a smaller number of hours with pivotal suppliers and inelastic demand. The conduct of market participants within these market structures has been consistent with competition consistent with existing offer capping, and the market performance results have been competitive.

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- **Mid-Atlantic Region.** The Regulation Market in the PJM Mid-Atlantic Region was cl eared based on participants' price offers during Phases 4 and 5-a. All suppliers were paid the market-clearing price, which is a function of the supply curve and PJM-defined demand. The supply curve consists of offered and eligible MW and the associated offer prices which are a combination of unit-specific offers plus opportunity cost (OC) as calculated by PJM.[8]

- **Western Region.** The Regulation Market in the Western Region during Phase 4 was cleared based on participants' cost-based offers. The cost-based regulation offers are defined to be the unit-specific incremental cost of providing regulation plus a margin of $7.50 per MWh plus opportunity cost calculated by PJM. During Phase 5-a, the market was cleared using a combination of price-based offers and cost-based offers. In Phase 5, Dominion and AEP were required to make cost-based offers based on their dominant position in the market while other participants made price offers.

- **PJM Combined Regulation Market.** During the trial period for the PJM Combined Regulation Market, the market was cleared using a combination of price-based offers and cost-based offers. Dominion and AEP were required to make cost-based offers based on their dominant position in the market while other participants made price offers.

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[8] As used here, the term, "opportunity cost" (OC), refers to the estimated lost opportunity cost (LOC) that PJM uses to create a supply curve on an hour-ahead basis. The term, "lost opportunity cost," refers to opportunity costs included in payments to generation owners.

## Market Structure

- **Demand.** Demand for regulation is determined by PJM based on an evaluation of the regulation required in order to meet reliability objectives. Required regulation remained constant for each control region throughout 2005 except for two periods during which a temporary adder was implemented at the direction of PJM.

- **Supply.** The supply of offered and eligible regulation in the PJM Mid-Atlantic Region was generally both stable and adequate, with an average 1.92 ratio of regulation supply offered and eligible to the hourly regulation requirement during Phases 4 and 5-a. While the average ratio of hourly regulation supply offered and eligible to regulation required was 1.64 for the Western Region during Phases 4 and 5-a, at times an inadequate supply of regulation was offered and eligible to participate in the market on an hourly basis in the Western Region. The average ratio of hourly regulation supply offered and eligible to regulation required was 1.88 for the PJM Combined Regulation Market during Phase 5-b.

### *Concentration of Ownership*

- **Mid-Atlantic Region.** During Phase 4 and Phase 5-a, the PJM Mid-Atlantic Region Regulation Market for eligible regulation had an average Herfindahl-Hirschman Index (HHI)[9] of 1751 which is classified as "moderately concentrated."[10] Less than 1 percent of the hours had an eligible regulation HHI above 2500. There were two suppliers with market shares greater than, or equal to, 20 percent. Seven percent of the hours had a single pivotal supplier, 48 percent of the hours had two pivotal suppliers and 88 percent of the hours had three pivotal suppliers.

- **Western Region.** During Phase 4 and Phase 5-a, the Western Region Regulation Market for eligible regulation had an average HHI of 2802 which is classified as "highly concentrated" and 58 percent of the hours had an HHI above 2500. There was a single pivotal supplier in 62 percent of the hours. One hundred percent of the hours had two pivotal suppliers.

- **PJM Combined Regulation Market.** During Phase 5-b, the PJM Combined Regulation Market had an average HHI of 1079 which is classified as

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9 See Section 2, "Energy Market, Part I," at "Market Concentration" for a more complete discussion of concentration ratios and the Herfindahl-Hirschman Index (HHI).

10 The market structure metrics reported in this summary are based on regulation capacity that is both offered to the market and is eligible to provide regulation.

"moderately concentrated." No suppliers had market shares greater than, or equal to, 20 percent. During 1 percent of hours, there was a single pivotal supplier. During 6 percent of hours, there were two pivotal suppliers. During 29 percent of the hours, there were three pivotal suppliers. For all units except CTs, during 5 percent of hours, there was a single pivotal supplier, during 23 percent of hours, there were two pivotal suppliers and during 68 percent of the hours, there were three pivotal suppliers.

## Market Conduct

- **Offers.** The offer price is the only component of the total regulation offer price provided by the unit owner and is applicable for the entire operating day. The regulation offer price is subject to a $100 per MWh offer cap in the Mid-Atlantic Region, was subject to offer capping in Phase 4 in the Western Region and was subject only to a $100 per MWh offer cap in Phase 5 in the Western Region, with the exception of the dominant suppliers, Dominion and AEP, whose offers were capped at marginal cost plus $7.50 per MWh plus opportunity cost. The average MW-weighted offer price for regulation in the PJM Mid-Atlantic Region during Phases 4 and 5-a was $15.63. The average MW-weighted offer price for regulation in the Western Region Regulation Market during Phases 4 and 5-a was $7.73. For the PJM Combined Regulation Market during Phase 5-b, the average MW-weighted offer price for regulation was $16.29.

## Market Performance

- **Price.** For the entire PJM regional transmission organization (RTO) from January 1, 2005, to December 31, 2005, the average price per MWh (regulation market-clearing price) associated with meeting PJM's demand for regulation was $49.73. For the PJM region during Phases 4 and 5-a, the average price per MWh for regulation was $36.39. For the Western Region Regulation Market during Phases 4 and 5-a, the average price per MWh for regulation was $42.64. For the PJM Combined Regulation Market during Phase 5-b, the average price per MWh was $64.03.

## The Spinning Reserve Markets

The structure of each of the Spinning Reserve Markets has been evaluated and the MMU has concluded that these markets are not structurally competitive as they are characterized by high levels of supplier concentration and inelastic demand. As a result, these markets are operated as markets with market-clearing prices and with offers based on the marginal cost of producing the service plus a margin and opportunity cost. The conduct of market participants within these market structures has been consistent with competition, and the market performance results have been competitive. Prices for spinning in the PJM Mid-Atlantic Region, the ComEd Control Zone, the Western Region

Comment [JEB1]: Nomenclature?

and Dominion are market-clearing prices determined by the supply curve and PJM-defined demand. The cost-based spinning offers are defined to be the unit-specific incremental cost of providing spinning reserve plus a margin of $7.50 per MWh plus opportunity cost calculated by PJM.

## Market Structure

- **Demand.** Computed in accordance with the specific spinning reserve requirements, the average MW spinning requirement was: 1,091 MW, for the PJM Mid-Atlantic Region; 217 MW for the ComEd Spinning Zone; 437 MW for the Western Region; and 5 MW for the Southern Spinning Reserve Zone (May to December only).

- **Supply.** For the PJM Mid-Atlantic Region, the offered and eligible excess supply ratio was 1.15. For the Western and Southern Regions, the ratio was 1.76. For the ComEd Control Zone, the ratio was 1.21.

- **Concentration of Ownership.** In 2005, market concentration was high in the Tier 2 Spinning Reserve Market. The average offered and eligible Spinning Reserve Market HHI for the PJM Mid-Atlantic Region throughout 2005 was 2940. The average Spinning Reserve Market HHI for the Western Region was 4593. The average Spinning Reserve Market HHI for ComEd Control Zone was 8844. The average Spinning Reserve Market HHI for Dominion was 10000.

**Comment [LLS2]:** In the body of the report, these regions are presented as Spinning Zones – can we introduce the terminology here?

## Market Performance

- **Price.** Load-weighted, average price associated with meeting the PJM system demand for Tier 2 spinning reserve throughout 2005 was $14.41 per MW, a $0.45 per MW decrease from 2004. The load-weighted, average price in the PJM Mid-Atlantic Region for Phases 4 and 5 was $15.44 per MW. The load-weighted, average price for spinning reserve in the ComEd Control Zone during Phases 4 and 5 was $12.73. The load-weighted, average price for spinning in the Western Control Zone during Phases 4 and 5 was $13.23. The load-weighted, average price for spinning in Dominion during Phase 5 was $13.08.

## Conclusion

PJM consolidated its Regulation Markets into a single Combined Regulation Market, on a trial basis, effective August 1, 2005. PJM's consolidation of its Regulation Markets resulted in improved performance and in increased competition. The MMU will make a recommendation in the near future as to whether the consolidation has resulted in a market that is structurally competitive. The market continues to be based on price offers for most sellers and all sellers are paid a market-clearing price based on offers plus opportunity costs. The result of this design has been a competitive outcome and consistent with competitive offers from all participants whether offer-capped or not. The

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marginal costs of providing regulation have been clearly defined and are consistent with the offers that would be made if the suppliers were behaving competitively.

PJM's Spinning Reserve Markets have worked effectively with offers based on marginal costs plus a margin and with all participants paid a market-clearing price based on the marginal offer including opportunity costs, despite the fact that these markets are characterized by high levels of seller concentration and inelastic demand.

The benefits of markets are realized under this approach to ancillary service markets. Even in the presence of structurally non-competitive markets, there are transparent, market-clearing prices based on competitive offers that account explicitly and accurately for opportunity costs. PJM should continue to consider whether additional ancillary service markets need to be defined in order to ensure that the market is compensating suppliers for services when appropriate.

## *Regulation Markets*

### Regulation Market Structure

Two major changes affected the structure of the Regulation Market in 2005. The first was the integration of Dominion into the Western Region Regulation Market on May 1, 2005. The second was the implementation of the PJM Combined Regulation Market on August 1, 2005.

### Demand

Demand for regulation does not change with price (is price inelastic). The demand for regulation is set administratively based on reliability objectives and forecast load. Regulation demand will be referred to in this report as required regulation.

The PJM Mid-Atlantic Region has different regulation requirements for on-peak hours and off-peak hours. The regulation requirement for the peak period is 1.1 percent of the peak-load forecast; for the off-peak period, it is 1.1 percent of the valley-load forecast.[11] During Phases 4 and 5-a, PJM Mid-Atlantic Region regulation requirements ranged from 226 MW of regulation capability for off-peak periods to 649 MW for on-peak periods. The average required regulation was 434 MW.

In the Western Region, the regulation requirement was 1.0 percent of the peak forecast load and did not vary between on-peak and off-peak periods. During Phases 4 and 5-a, the requirement ranged from 320 MW to 771 MW, averaging 517 MW.

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11 See "PJM Manual for Scheduling Operations, M-11," Revision 25 (August 19, 2005), p. 51.

During Phase 5-b, the PJM Mid-Atlantic Region and the Western Region Regulation Markets were combined into the PJM Combined Regulation Market. The regulation requirement for this combined market was defined to equal the sum of the separate regulation requirements for each region. During Phase 5-b, the regulation requirement ranged from 662 MW to 1,404 MW, averaging 978 MW.

Although the required regulation specification remained constant for each control region throughout 2005, a temporary adder was implemented at the direction of PJM for two periods. As a result, regulation was purchased in addition to the full regulation requirement. On October 23, 2004, in response to problems after the integration of the ComEd Control Zone into the Western Region, required regulation was increased by 75 MW for each regulation zone. This regulation adder was subsequently reduced until regulation was returned to its base requirement on February 11, 2005.

On April 15, 2005, in response to a persistent problem with frequency excursions, a 100 MW increment was added to the regulation demand for both the Mid-Atlantic and Western Regions. It was phased out and then eliminated on May 14, 2005. Table 0-1 contains a list of regulation adder amounts by date.

**Table 0-1 Temporary regulation adder: October 23, 2004, to May 15, 2005 << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\regulation adder table.xls (tab:regulation adder)>>**

| Regulation Adder Date | Change in Regulation MW per Control Zone | Total Regulation Adder (MW) per Control Zone |
|---|---|---|
| 23-Oct-04 | 75 | 75 |
| 29-Oct-04 | (75) | 0 |
| 1-Nov-04 | 75 | 75 |
| 11-Nov-04 | 100 | 175 |
| 17-Dec-04 | (50) | 125 |
| 7-Jan-05 | (25) | 100 |
| 14-Jan-05 | (25) | 75 |
| 26-Jan-05 | (25) | 50 |
| 4-Feb-05 | (25) | 25 |
| 11-Feb-05 | (25) | 0 |
| 15-Apr-05 | 100 | 100 |
| 6-May-05 | (25) | 75 |
| 8-May-05 | (75) | 0 |
| 12-May-05 | 50 | 50 |
| 14-May-05 | (50) | 0 |

The temporary additional regulation requirements between mid-April and mid-May reflected an effort by PJM to solve simultaneous problems of insufficient regulation in the Western Region Regulation Market, particularly during off-peak hours, and frequency excursions that impacted PJM's compliance requirement for CPS2.[12]

Regulation obligation is determined hourly for each load-serving entity (LSE) by applying the real-time load ratio share (adjusted for scheduled load responsibility) to the actual amount of regulation assigned for that hour adjusted for any bilaterals and self-supply. The hourly regulation charge for each LSE is equal to the hourly regulation market-clearing price (RMCP) multiplied by the MW of regulation purchased from the market, plus the LSE's percentage share of any opportunity cost incurred by generation owners over and above the RMCP, plus the LSE's percentage share of any unrecovered costs incurred by those units called on by PJM for the sole purpose of providing regulation.

## Supply

The supply of regulation can be measured as regulation capability, regulation offered, or regulation offered and eligible. For purposes of evaluating the Regulation Market, the relevant regulation supply is the level of supply that is both offered to the market on an hourly basis and is eligible to participate in the market on an hourly basis. This is the only supply that is actually considered in the determination of market prices. The level of supply that clears in the market on an hourly basis is called assigned regulation. Assigned regulation is selected from regulation that is both offered and eligible.

Regulation capability represents the total volume of regulation capability reported by resource owners based on unit characteristics.

Regulation offered represents the level of regulation capability actually offered to the PJM Regulation Market. Resource owners may offer those units with approved regulation capability into the PJM Regulation Market. PJM does not require a resource capable of providing regulation service to offer its capability to the market. Regulation offers may be submitted on a daily basis and these daily offers may be modified on an hourly basis.

Regulation offered and eligible represents the level of regulation capability actually offered to the PJM Regulation Market and actually eligible to provide regulation in an hour. Some regulation offered to the market is not eligible to participate in the Regulation Market as a result of identifiable offer parameters specified by the supplier. As an example, the regulation capability of a unit will be included in regulation offered

12 See Appendix F, "Ancillary Service Markets," for additional information on area control error (ACE) control and control performance standard (CPS).

based on the daily offer and availability status, but that regulation capability will not be eligible in one or more hours because the supplier sets the availability status to unavailable for one or more hours of that same day. (The availability status of a unit may be set in both a daily offer and an hourly update table in the PJM market software.) As another example, the regulation capability of a unit will be included in regulation offered if the owner of a unit offers regulation, but that regulation capability will not be eligible if the owner sets the unit's economic maximum generation level equal to its economic minimum generation level. In that case, the unit cannot provide regulation and is not eligible to provide regulation. As another example, the regulation capability of a unit will be included in regulation offered but that regulation capability will not be eligible if the unit is not operating, unless the unit is a combustion turbine that meets specific operating parameter requirements.

Only those offers which are eligible to provide regulation in an hour are part of supply for that hour, and only those offers are considered for purposes of clearing the market. Regulation assigned represents those regulation resources selected through the regulation market-clearing mechanism to provide regulation service for a given hour.

While the average regulation supply-to-requirement ratio of offered regulation in the Western Region Regulation Market during Phase 5-a was generally adequate at 1.70, the situation was more complicated than the supply-to-requirement ratio indicates. Regulation capacity was always adequate in the sense that the total reported capability was adequate.[13] Occasionally, however, PJM dispatchers had to redispatch generation uneconomically to satisfy reliability requirements. PJM encountered some difficulty with insufficient regulation supply in the Western Regulation Zone during Phase 5-a. Shortly after the Dominion integration on May 1, 2005, there was at times an inadequate supply of regulation that was offered and eligible to participate in the market on an hourly basis. This situation was most acute in the Western Region Regulation Market in May 2005 during off-peak periods when market solutions resulted in deficits 13.6 percent of the time and occasional off-peak hourly price spikes. (See Figure 0-1.) These higher than normal deficits generally occurred during off-peak hours when regulation-capable units were unavailable to regulate because they were not operating. In May, PJM frequently operated under minimum generation conditions, especially during off peak hours. The combination of a regulation deficit and minimum generation conditions required dispatchers to balance the need for more regulation with the need for less generation. Dispatchers at times chose to operate with regulation deficits. This situation improved during June (deficits in 5.3 percent of all periods) and was resolved in July when the deficit percentage returned to its overall Phases 4 and 5-a average.

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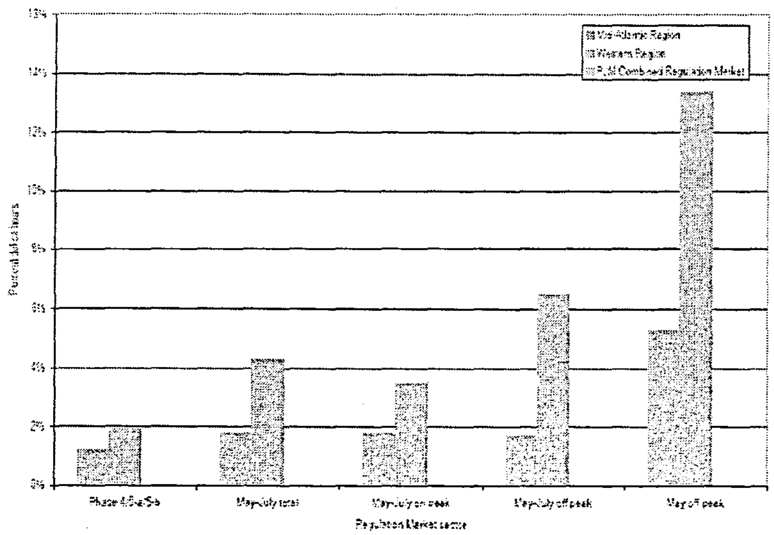
13 See "Regulation Capacity, Daily Availability, Hourly Supply and Price," in Appendix F, "Ancillary Service Markets," for a definition of capacity, availability and supply.

Figure 0-1 compares the percentage of regulation deficit hours across several Regulation Market periods, including all of 2005, Phase 5 only, off-peak and on-peak hours and off-peak hours in May. The abnormally high deficits that occurred in the Western Region particularly during off-peak hours in early May are clearly indicated.

**Figure 0-1 Regulation deficit analysis: Calendar year 2005 <<H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\deficit study.xls (tab:graph)>>**




Regulation deficits in the west were reduced during June and returned to normal in July. Also indicated in Figure 0-1 is the extent to which regulation deficits were all but eliminated after the PJM Combined Regulation Market. There was only one period of regulation deficit in the PJM Combined Regulation Market during Phase 5-b. This deficit does not show up in Figure 0-1 because the percentage of regulation deficit hours rounds to zero percent.

## Concentration of Ownership

### *Market Structure Definitions*

The market structure analysis follows the Commission logic specified in the AEP order.[14] The logic of the delivered price test is followed by calculating market share, HHI and pivotal supplier metrics for each market configuration.[15] The analysis presented here differs in two ways from the Commission's delivered price test. The delivered price test would start with the universe of regulation offered and eligible and then limit the analysis to those offered and eligible units that could provide regulation at less than or equal to 1.05 times the clearing price. The analysis here uses a proxy for the 1.05 times the clearing price definition used to define the relevant market. In PJM, the supply of regulation generally consists of two relatively distinct segments: an all units except combustion turbine (CT) segment (consisting of steam and hydroelectric units) and a CT segment. While steam, hydroelectric and CT units can and do provide regulation, the steam/hydroelectric segment is generally lower cost and is relatively homogeneous while the CT segment is generally significantly higher cost and similarly relatively internally homogeneous. Rather than directly applying the 1.05 times the clearing price market definition, the analysis here focuses separately on the steam/hydroelectric and the CT portions of the market. The steam/hydroelectric segment of the market is used in place of including only sellers that offer for a price less than or equal to the clearing price times 1.05 when a steam/hydroelectric unit is marginal, although the segment approach results in a substantially larger market definition. The CT segment is similarly used in place of including only sellers that offer for a price less than or equal to the clearing price times 1.05 when a CT unit is marginal, although again the segment approach probably results in a larger market definition. The data are presented including all units, all units except CTs (steam and hydroelectric) and CTs. In addition, the analysis here includes the results of the one, two and three pivotal supplier tests.

**Deleted:** is bifurcated into

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The analysis here includes all regulation provided by each supplier and made offered and eligible. While the market structure results are reported for regulation offered, this is not directly relevant to a determination of whether a market structure is competitive. Regulation must be both offered and eligible in an hour in order for it to be part of the market. This is termed economic capacity under the delivered price test.

The delivered price test may also be applied using available economic capacity, or gross supply by participant net of their load obligation. The fact that suppliers have load

[14] *AEP Power Mktg. Inc.*, 107 FERC ¶ 61,018 ("AEP Order"), order on reh'g, 108 FERC ¶ 61,026 (2004).

[15] AEP Order at 105 *et seq.*

obligations may affect their incentives to exercise market power although not unambiguously. However, as the amount of load that will be served by the integrated utilities in the future is unknown given the unknown extent of retail competition, a reasonable approach is to evaluate the entire regulation supply, or economic capacity, as is done here.

The Commission's AEP order indicates that failure of any one of the specified tests is adequate for a showing of market power including tests based on market concentration, market share and pivotal supplier analyses. The analysis presented here goes further in order to analyze the significance of excess supply. The MMU applies the pivotal supplier test using one, two and three pivotal suppliers. In addition, when there are hours with one, two or three pivotal suppliers, the analysis also examines the frequency with which individual generation owners are in the pivotal group. If the hours that fail a pivotal supplier test have the same pivotal supplier(s) for a significant proportion of the hours, that information can be used to identify dominant suppliers.

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The pivotal supplier tests represent an analytical approach to the issue of excess supply. Excess supply, by itself, is not necessarily adequate to ensure a competitive outcome. A monopolist could have substantial excess supply but the monopolist would not be expected to change its market behavior as a result. The same logic applies to a small group of dominant suppliers. However, if there is adequate supply without the three dominant suppliers to meet the demand, then the market can reasonably be deemed competitive.

### *PJM Mid-Atlantic Regulation Market – Phases 4 through 5-a*

During Phases 4 through 5-a, in the Regulation Market in the Mid-Atlantic Region, the offer capability was 2,408 MW.[16] The level of regulation resources offered on an hourly level and the level of regulation resources both offered and eligible to participate on an hourly level in the market were lower than the total regulation capability. In 2005 the average hourly offer level was 1,128 MW or 47 percent of offer capability while the average hourly eligible offer level was 835 MW or 35 percent of offer capability.

The ratio of the hourly regulation supply offered to the hourly regulation requirement, averaged 2.60 for the PJM Mid-Atlantic Region during Phases 4 and 5-a. When this ratio equals 1.0, it indicates that offered supply exactly equals demand for the referenced time period. Based upon regulation offered and eligible, this ratio averaged 1.92. The average regulation requirement for the PJM Mid-Atlantic Region during 2005 was 434 MW.

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16 Offer capability is defined as the maximum daily offer volume for each offering unit during the period without regard to the actual availability of the resource.

Hourly HHI values were calculated based upon the regulation offered, regulation offered and eligible, and regulation assigned. Based upon regulation offered, HHI ranged from a maximum of 2064 to a minimum of 1088 with an average value of 1510. Based upon regulation offered and eligible, HHI values ranged from a maximum of 2787 to a minimum HHI of 1190, with an average value of 1751. Less than 1 percent of hours had an eligible regulation HHI above 2500. Based upon regulation assigned, HHI values ranged from a maximum of 9690 to a minimum HHI of 1118. The average HHI value for regulation assigned was 2260. Thirty-one percent of hours had an assigned regulation HHI above 2500. Table 0-2 summarizes the January 2005 through July 2005 PJM Mid-Atlantic Region Regulation Market HHIs.

**Table 0-2 PJM Mid-Atlantic Region Regulation Market hourly HHI: Phases 4 and 5-a< 14_Graphs_Tables\HHI_Tables.xls (Tab PJM HHIs) >**

| | Minimum | Average | Maximum | Percent Hours > 2500 |
|---|---|---|---|---|
| Offered | 1088 | 1510 | 2064 | 0% |
| Eligible | 1190 | 1751 | 2787 | 0% |
| Assigned | 1118 | 2260 | 9690 | 31% |

As noted above, regulation supply in PJM is bifurcated into the combustion turbine (CT) segment and the all units except CTs segment because, while some CTs provide regulation, they are very expensive to operate solely to provide regulation. In order to approximate the delivered price test approach, the Regulation Market HHI is reported with and without CTs. (See Table 3.) In the PJM Mid-Atlantic Region, HHIs are slightly lower without CTs because the CTs are disproportionately owned by the company with the largest market share.

**Table 3 PJM Mid-Atlantic Region Regulation Market hourly HHI (All units except CTs): Phases 4 and 5-a< 14_Graphs_Tables\PJMHHIResultsxls.xls (Tab NO_CTs) >**

| | Minimum | Average | Maximum | Percent Hours > 2500 |
|---|---|---|---|---|
| Offered | 1078 | 1475 | 2354 | 0% |
| Eligible | 1183 | 1718 | 2941 | 0% |
| Assigned | 1118 | 2266 | 9690 | 31% |

During Phases 4 and 5-a, two suppliers had market shares greater than, or equal to, 20 percent based on regulation offered and eligible. For the market segment excluding CTs, two suppliers had market shares greater than, or equal to, 20 percent based on regulation offered and eligible.

During Phases 4 and 5-a, 7 percent of the hours failed the single pivotal supplier test for offered and eligible supply in the PJM Mid-Atlantic Region's market.[17] This means that, during the seven-month period, for 7 percent of the hours the total regulation requirement could not be met in the absence of the largest supplier. Forty-eight percent of the hours failed the two pivotal supplier test. This means that, during 48 percent of the hours, the total regulation requirement could not be met in the absence of the two largest suppliers. Eighty-eight percent of the hours failed the three pivotal supplier test. This means that, during 88 percent of the hours, the total regulation the regulation requirement could not be met in the absence of the three largest suppliers.

For the market segment excluding CTs, the percentage of one pivotal supplier hours in the eligible Regulation Market increases from 7 percent to 10 percent, the percentage of two pivotal supplier hours increases from 48 percent to 52 percent and the percentage of three pivotal supplier hours increases from 88 percent to 89 percent. Table 0-4 summarizes the PJM Mid-Atlantic Region Regulation Market pivotal supplier statistics for Phases 4 and 5-a. The pivotal supplier statistics are also presented for all regulating units except CTs. (See Table 5.) Three companies are pivotal more than 75 percent of the three pivotal supplier intervals for all units, and for the all units except CTs segment.

**Table 0-4 PJM Mid-Atlantic Region Regulation Market pivotal supplier statistics: Phases 4 and 5-a< 14_Graphs_Tables\Piv Sup Tables.xls (Tab PJM PivSup) >**

| | Hours Offered (Percent) | Hours Eligible (Percent) |
|---|---|---|
| 1 pivotal | 0% | 7% |
| 2 pivotal | 3% | 48% |
| 3 pivotal | 35% | 88% |

**Table 5 PJM Mid-Atlantic Region Regulation Market pivotal supplier statistics (All units except CTs): Phases 4 and 5-a< 14_Graphs_Tables\PJMPivSupResultsxls.xls (Tab NonCTPivSupHours) >**

| | Hours Offered (Percent) | Hours Eligible (Percent) |
|---|---|---|
| 1 pivotal | 0% | 10% |
| 2 pivotal | 9% | 52% |
| 3 pivotal | 52% | 89% |

17 The pivotal supplier results are provided for all offered regulation as additional information although these results are not directly relevant to the market structure analysis.

Based on these market structure results, the MMU concludes that the market structure of the PJM Mid-Atlantic Region Regulation Market during Phases 4 and 5-a can no longer be considered to be consistent with a competitive outcome. The combination of two market participants with market shares greater than, or equal to, 20 percent and the pivotal supplier results are not consistent with a competitive structure. The market in the PJM Mid-Atlantic Region was operated by PJM as a competitive market prior to the Combined Regulation Market.

### *Western Region Regulation Market – Phases 4 and 5-a*

During Phases 4 and 5-a, in the Western Region Regulation Market, the submitted offer capability was 2,267 MW. The level of resources offered on an hourly level and the level of regulation resources both offered and eligible to participate on an hourly level in the Regulation Market were lower than the submitted regulation offer capability. Between the beginning of Phase 4 and the end of Phase 5-a, the average hourly offer level was 938 MW or 41 percent of the submitted capability, while the average hourly eligible offer level was 847 MW or 37 percent of the submitted capability.

The ratio of the hourly regulation supply offered to the hourly regulation requirement, averaged 1.81 for the Phases 4 and 5-a Western Region Regulation Market. Based upon regulation offered and eligible, this ratio averaged 1.64. The average regulation requirement for the Phases 4 and 5-a Western Region Regulation Market was 517 MW.[18]

Hourly HHI values were calculated based upon the regulation offered, regulation offered and eligible and regulation assigned. Based upon regulation offered, HHI ranged from a maximum of 4357 to a minimum of 1748 with an average value of 2730. Fifty-eight percent of hours had an offered regulation HHI above 2500. Based upon regulation offered and eligible, HHI values ranged from a maximum of 4810 to a minimum HHI of 1757, with an average value of 2802. Fifty-eight percent of hours had an eligible regulation HHI above 2500. Based upon regulation assigned, HHI values ranged from a maximum of 7162 to a minimum HHI of 1698. The average HHI value for regulation assigned was 2973. Sixty-four percent of hours had an assigned regulation HHI above 2500. Table 0-6 summarizes the January through July 2005 Western Region Regulation Market HHIs.

18 See Appendix F, "Ancillary Service Markets," for additional detail on the regulation requirements.

**Table 0-6 PJM Western Region Regulation Market hourly HHI: Phases 4 and 5-a <14_Graphs_Tables\HHI Tables.xls (Tab WRM HHIs) >**

| | Minimum | Average | Maximum | Percent Hours > 2500 |
|---|---|---|---|---|
| Offered | 1748 | 2730 | 4357 | 58% |
| Eligible | 1757 | 2802 | 4810 | 58% |
| Assigned | 1698 | 2973 | 7162 | 64% |

For the market segment excluding CTs, HHIs in the Western Region Regulation Market are somewhat higher. (See Table 7.)

**Table 7 PJM Western Region Regulation Market hourly HHI (All units except CTs): Phases 4 and 5-a< 14_Graphs_Tables\WRMHHIResultsxls.xls (Tab NO_CTs) >**

| | Minimum | Average | Maximum | Percent Hours > 2500 |
|---|---|---|---|---|
| Offered | 1859 | 2960 | 4973 | 60% |
| Eligible | 1856 | 3029 | 5249 | 62% |
| Assigned | 1738 | 2984 | 7162 | 65% |

During Phases 4 and 5-a, one supplier had a market share greater than, or equal to, 20 percent based on offered and eligible regulation. For the market segment excluding CTs, one supplier had a market share greater than, or equal to, 20 percent based on offered and eligible regulation.

During Phases 4 through 5-a, 62 percent of the hours failed the single pivotal supplier test for offered and eligible supply in the Western Region Regulation Market. This means that, during the seven-month period, the total regulation requirement could not be met for 62 percent of the hours in the absence of the largest supplier. One hundred percent of the hours failed the two pivotal supplier test. This means that, during 100 percent of the hours, the total regulation requirement could not be met in the absence of the two largest suppliers. One hundred percent of the hours failed the three pivotal supplier test. This means that, during 100 percent of the hours, the total regulation requirement could not be met in the absence of the three largest suppliers. Table 0-8 summarizes the Western Region Regulation Market pivotal supplier statistics for Phases 4 through 5-a.

**Table 0-8 PJM Western Region Regulation Market pivotal supplier statistics: Phases 4 and 5-a .<14_Graphs_Tables\RSI Tables.xls (Tab WRM PivSup)>**

| | Hours Offered (Percent) | Hours Eligible (Percent) |
|---|---|---|
| 1 pivotal | 30% | 62% |
| 2 pivotal | 100% | 100% |
| 3 pivotal | 100% | 100% |

Table 9 presents pivotal supplier statistics for the Western Region regulation pool for all units except CTs. Eighty-eight percent of hours fail the one pivotal supplier test. In both the all units and all units except CTs market segments the same company that was the one pivotal supplier was also pivotal for more than 95 percent of the hours in which two and three suppliers were pivotal.

**Table 9 PJM Western Region Regulation Market pivotal supplier statistics (All units except CTs:): Phases 4 and 5-a .<14_Graphs_Tables\WRMPivSupResultsxls.xls (Tab NonCTPivSupHours)>**

| | Hours Offered (Percent) | Hours Eligible (Percent) |
|---|---|---|
| 1 pivotal | 69% | 88% |
| 2 pivotal | 100% | 100% |
| 3 pivotal | 100% | 100% |

Based on these market structure results, the MMU concludes that the market structure of the Western Region Regulation Market was not consistent with a competitive outcome. The Regulation Market in the Western Region was operated by PJM, wi th the two dominant suppliers offer-capped, as a market with market-clearing prices during Phases 4 and 5-a.

### *PJM Combined Regulation Market – Phase 5-b*

The PJM Combined Regulation Market during Phase 5-b was comprised of the PJM Western Region (the ComEd, AEP, DAY, Dominion, DLCO and AP Control Zones) and the PJM Mid-Atlantic Region. For the Phase 5-b PJM Combined Regulation Market, the submitted capability was 5,491 MW. The average hourly offer level was 2,370 MW while the average hourly eligible offer level was 1,841 MW.

The ratio of the hourly regulation supply offered to the hourly regulation requirement averaged 2.42. Based upon regulation offered and eligible, this ratio averaged 1.88. The average regulation requirement for the Phase 5-b PJM Combined Regulation Market was 978 MW.

Hourly HHI values were calculated based upon the regulation offered, regulation offered and eligible and regulation assigned. Based upon regulation offered, HHI ranged from a maximum of 1331 to a minimum of 812 with an average value of 1001. Based upon regulation offered and eligible, HHI ranged from a maximum of 1562 to a minimum HHI of 866, with an average value of 1079. Based upon regulation assigned, HHI values ranged from a maximum of 2390 to a minimum of 878. The average HHI value for regulation assigned was 1299. Table 0-10 summarizes HHI results for the PJM Combined Regulation Market.

**Table 0-10 PJM Combined Regulation Market HHI: Phase 5-b <<14_Graphs_Tables\HHI Tables.xls (Tab RTO HHIs)>>**

| | Minimum | Average | Maximum | Percent Hours > 2500 |
|---|---|---|---|---|
| Offered | 812 | 1001 | 1331 | 0 |
| Eligible | 866 | 1079 | 1562 | 0 |
| Assigned | 878 | 1299 | 2390 | 0 |

For the market segment excluding CTs, HHIs are essentially the same. (See Table 11.)

***Table 11* PJM Combined Regulation Market HHI (All units except CTs): Phase 5-b< 14_Graphs_Tables\RTOHHIResultsxls.xls (Tab NO_CTs) >**

| | Minimum | Average | Maximum | Percent Hours > 2500 |
|---|---|---|---|---|
| Offered | 845 | 1016 | 1417 | 0 |
| Eligible | 891 | 1080 | 1659 | 0 |
| Assigned | 878 | 1301 | 2400 | 0 |

During Phase 5-b, in the PJM Combined Regulation Market, no suppliers had a market share greater than, or equal to, 20 percent for regulation offered and eligible. For the market segment excluding CTs, no suppliers had a market share greater than, or equal to, 20 percent for regulation offered and eligible. For the CT market segment, two suppliers had market shares in excess of 20 percent for regulation offered and eligible.

During Phase 5-b, 1 percent of the hours failed the single pivotal supplier test for offered and eligible supply in the PJM Combined Regulation Market. This means that, during the five-month period, the total regulation requirement could not be met for 1 percent of the hours in the absence of the largest supplier. Six percent of the hours failed the two pivotal supplier test. This means that, during 6 percent of the hours, the total regulation requirement could not be met in the absence of the two largest suppliers. Twenty-nine percent of the hours failed the three pivotal supplier test. This means that, during 29 percent of the hours, the total regulation requirement could not be met in the absence of the three largest suppliers. Table 0-12 summarizes the PJM Combined Regulation Market's pivotal supplier results for Phase 5-b. For all units including CTs the same company that was the one pivotal supplier for more than one-third of the one pivotal supplier intervals was also pivotal for more than 75 percent of the two pivotal supplier intervals and more than 80 percent of the hours in which two and three suppliers were pivotal. A second company was pivotal during more than 25 percent of the two pivotal and approximately 50 percent of three pivotal hours.

**Table 0-12 PJM Combined Regulation Market pivotal supplier statistics: Phase 5-b <<<14_Graphs_Tables\PivSup Tables.xls (Tab RTO PivSup)>>**

| | Hours Offered (Percent) | Hours Eligible (Percent) |
|---|---|---|
| 1 pivotal | 0% | 1% |
| 2 pivotal | 0% | 6% |
| 3 pivotal | 1% | 29% |

Table 13 presents pivotal supplier statistics for the PJM Combined Regulation Market's segment for all units except CTs.

**Table 13 PJM Combined Regulation Market pivotal supplier statistics (All units except CTs): Phase 5-b <<<14_Graphs_Tables\RTOPivSupResultsxls.xls (Tab NonCTPivSupHours)>>**

| | Hours Offered (Percent) | Hours Eligible (Percent) |
|---|---|---|
| 1 pivotal | 0% | 5% |
| 2 pivotal | 1% | 23% |
| 3 pivotal | 14% | 68% |

For the market segment excluding CTs, the percentage of one pivotal supplier hours in the eligible Regulation Market increases from 1 percent to 5 percent, the percentage of two pivotal supplier hours increases from 6 percent to 23 percent and the percentage of three pivotal supplier hours increases from 29 percent to 68 percent. (See Table 13.) In the all units except CTs market segment, the same company that was the one pivotal supplier for more than two-thirds of the one pivotal supplier intervals was also pivotal for more than 80 percent of the two pivotal supplier intervals and more than 95 percent of the hours in which two and three suppliers were pivotal. A second company is pivotal during more than 60 percent of the two pivotal and three pivotal hours, while the third pivotal position is shared by three companies with an approximately equal frequency of occurrence.

The MMU will make a recommendation to PJM members in the near future regarding the structural competitiveness of this market.

**Deleted:** Based on this analysis, the MMU recommends that PJM continue to operate the Regulation Market as a single Combined Regulation Market. This recommendation is based on improved operational results and on the increased competitiveness of the Combined Market. Nonetheless, based on these market structure results, the MMU concludes that the market structure of the PJM Combined Regulation Market was not consistent with a competitive outcome. For Phase 5-b, the PJM Combined Regulation Market was operated by PJM, with the two dominant suppliers offer-capped, as a price-based market with market-clearing prices. It would be reasonable, consistent with the results of the analysis and with FERC's actions regarding the Western Region Regulation Market, to offer cap only the two dominant market participants identified in the analysis of the Combined Regulation Market. These results are based on the first five months of operation of the combined market. The MMU will continue to analyze market outcomes and market structure for the Combined Regulation Market.¶

## Regulation Market Conduct

## Regulation Offers

Generators wishing to participate in any of the PJM Regulation Markets must submit regulation offers for specific units by hour 1800 EPT of the day before the operating day. The regulation offer price is subject to a $100 per MWh offer cap in PJM control zones with the exception of the dominant suppliers Dominion and AEP whose offers are capped at marginal cost plus $7.50 per MWh plus opportunity cost. In the PJM Western Region during Phase 4, all regulation offers were capped at $7.50 per MWh plus the cost of providing regulation service because that market was determined to be not structurally competitive. As in any competitive market, regulation offers at marginal cost are considered to be competitive. In PJM, a $7.50 per MWh adder is considered to be consistent with competitive offers based on an analysis of historical offer behavior.

The offer price is the only component of the regulation offer applicable for the entire operating day. The following information must be included in each offer, but can be entered or changed up to 60 minutes prior to the operating hour: regulating status (available, unavailable or self-scheduled); regulation capability; and high and low regulation limits. The Regulation Market is cleared on a real-time basis, and regulation prices are posted hourly throughout the operating day. The amount of self-scheduled regulation is confirmed 60 minutes before each operating hour, and regulation assignments are made 30 minutes before each operating hour.

PJM's Regulation Markets are cleared hourly, based upon both offers submitted by the units and the hourly opportunity cost of each unit.[19] The effective offer price is the sum of the unit-specific offer and the opportunity cost. In order to clear the market, PJM ranks units which offer and are eligible to regulate by effective offer price and selects the lowest offers in order until the amount of regulation required for the hour is satisfied at

[19] PJM estimates the opportunity cost for units providing regulation based on a forecast of locational marginal price (LMP) for the upcoming hour. Opportunity cost is included in the market-clearing price.

least cost. The price that results is the RMCP, and the unit that sets this price is the marginal unit.

## Regulation Market Performance

## Regulation Prices

Figure 0-2 shows both the daily average regulation market-clearing price and the opportunity cost component for the marginal units in the PJM Mid-Atlantic Region during Phases 4 and 5-a. Figure 0-3 shows the same data for the Western Region Regulation Market during Phases 4 and 5-a. Figure 0-4 shows the same data for the PJM Combined Regulation Market during Phase 5-b. All units chosen to provide regulation during Phases 4 and 5 received as payment the higher of the clearing price multiplied by the unit's assigned regulating capability, or the unit's regulation bid multiplied by its assigned regulating capability plus the individual unit's real-time opportunity cost.[20]

Regulation credits are awarded to generation owners that have either self-scheduled regulation or sold regulation into the market. Regulation credits for units self-scheduled to provide regulation are equal to the RMCP times the unit's self-scheduled regulating capability. Regulation credits for units that offered regulation into the market and were selected to provide regulation are the higher of the RMCP times the unit's assigned regulating capability, or the unit's regulation bid times its assigned regulating capability plus the opportunity cost that unit incurred. Although most units are paid RMCP times their assigned regulation MW, the RMCP is itself strongly dependent on the lost opportunity cost based upon forecast LMP calculated for the marginal unit during market clearing. This means that the total cost of regulation is very strongly dependent upon lost opportunity cost, which is dependent upon forecast LMP. Figure 0-2, Figure 0-3 and Figure 0-4 graph the RMCP against the estimated lost opportunity cost of the marginal unit (calculated at market clearance, adjusted for real-time deviations in LMP and averaged over the day). Most of the cost of regulation comes from the lost opportunity cost of the marginal unit. The rest of the RMCP is the unit's regulation offer. The average offer of the marginal unit for the PJM Mid-Atlantic Region during Phases 4 and 5-a was $15.33. The average offer of the marginal unit for the Western Region Regulation Market during Phases 4 and 5-a was $8.66. The average offer of the marginal unit for the PJM Combined Regulation Market during Phase 5-b was $13.16. In the PJM Mid-Atlantic Region Regulation Market during Phases 4 and 5-a, marginal unit lost opportunity cost (LOC) averaged 57 percent of the RMCP. In the Western Region Regulation Market during Phases 4 and 5-a, marginal unit LOC averaged 76 percent of

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[20] See "PJM Operating Agreement, Accounting, m28," Revision 27, Section 4, "Regulation Credits" (October 1, 2004), pp. 26-27. PJM uses estimated opportunity cost to clear the market and real-time opportunity cost to compensate generators that provide regulation and spinning. Real-time opportunity cost is calculated using real-time LMP.

RMCP. In the PJM Combined Regulation Market during Phase 5-b, marginal unit LOC averaged 79 percent of RMCP.

**Figure 0-2 PJM Mid-Atlantic Region daily average regulation clearing price and adjusted estimated marginal unit opportunity cost: Phases 4 and 5-a << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Fig5_2_RMCP_LOC_graph_PJM_new.xls (tab: Graph)>>**

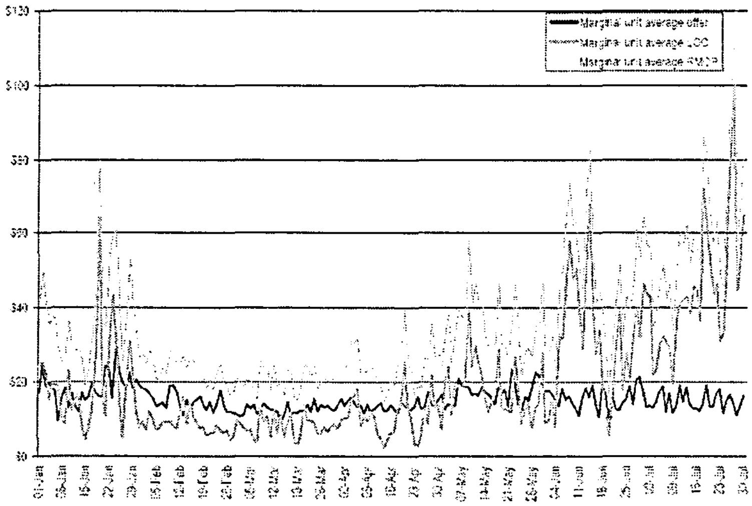

**Figure 0-3 PJM Western Region daily average regulation clearing price and adjusted estimated marginal unit opportunity cost: Phases 4 and 5-a << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Fig5_3_RMCP_LOC_graph_WRM_new.xls (tab: Graph)>>**

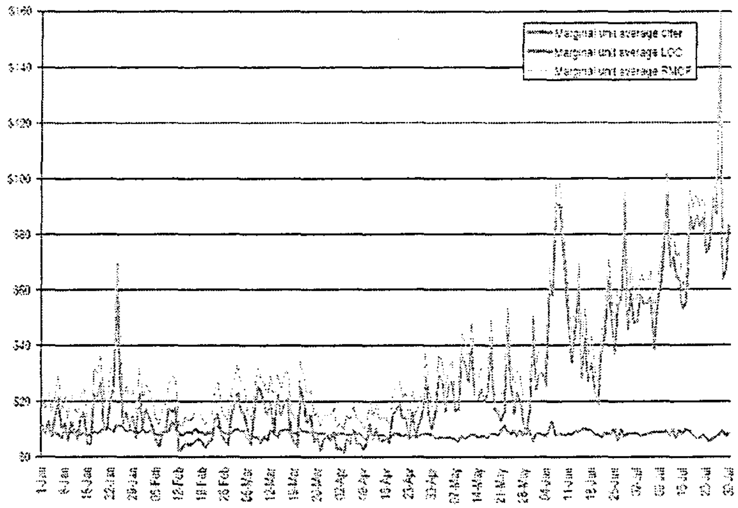




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**Figure 0-4 PJM Combined Regulation Market daily average regulation clearing price and adjusted estimated marginal unit opportunity cost: Phase 5-b < H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Fig5_4_RMCP_LOC_graph_RTO_new.xls (tab: Graph)>**

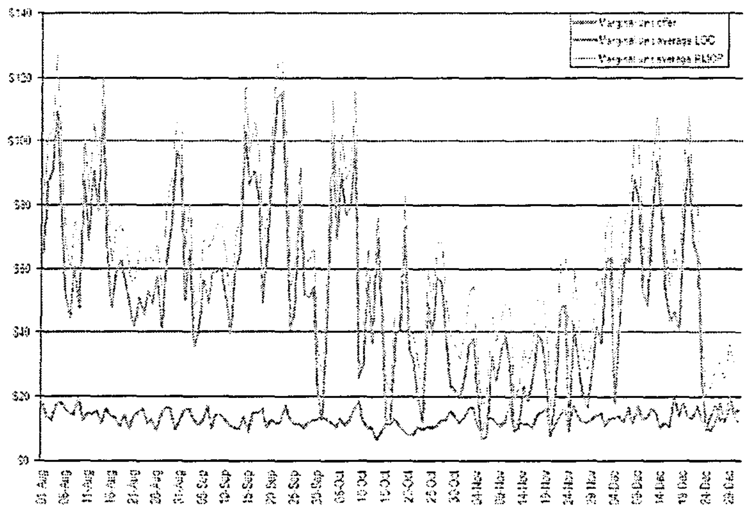


Figure 0-5, Figure 0-6 and Figure 0-7 compare the regulation price per MWh to the regulation MW purchased for each of the Regulation Markets. As the regulation requirement is a linear function of daily forecast peak load in all markets, all three graphs show that despite considerable daily variation, the price of regulation and the demand for regulation increase or decrease together on a seasonal scale. System LMP increases with load because higher priced units must be dispatched to meet demand and those increases in system LMP cause the opportunity cost to rise by increasing the spread between LMP and the energy offers of the regulating units.

**Figure 0-5 PJM Mid-Atlantic Region daily regulation MW purchased vs. price per MW: Phases 4 and 5-a <H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\RegMWPurch_vs_Price.xls (tab: PJMGraph)>>**

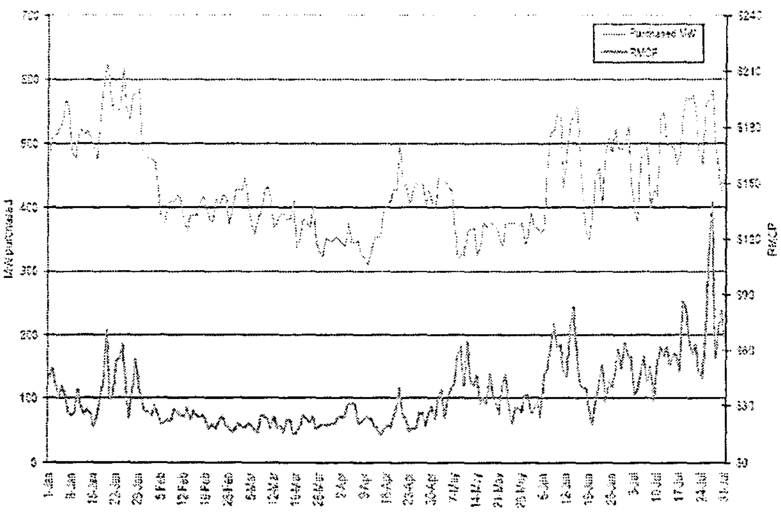


**Figure 0-6 PJM Western Region daily regulation MW purchased vs. price per MW: Phases 4 and 5-a <H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\RegMWPurch_vs_Price.xls (tab: WRMGraph)>>**

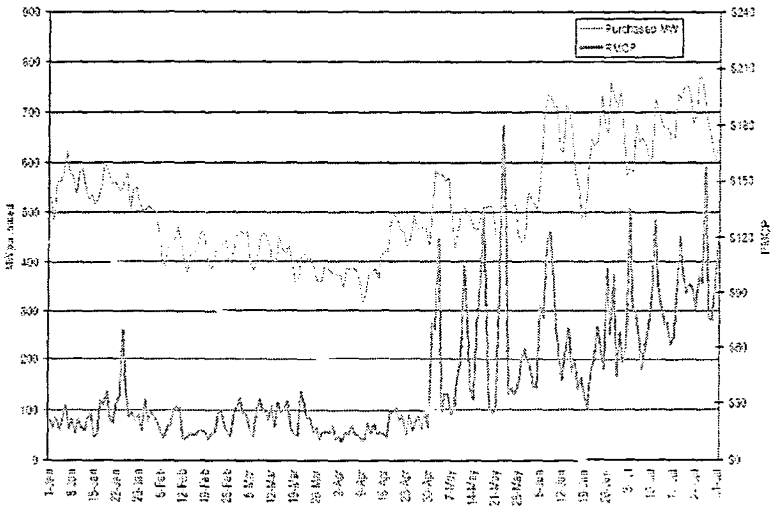
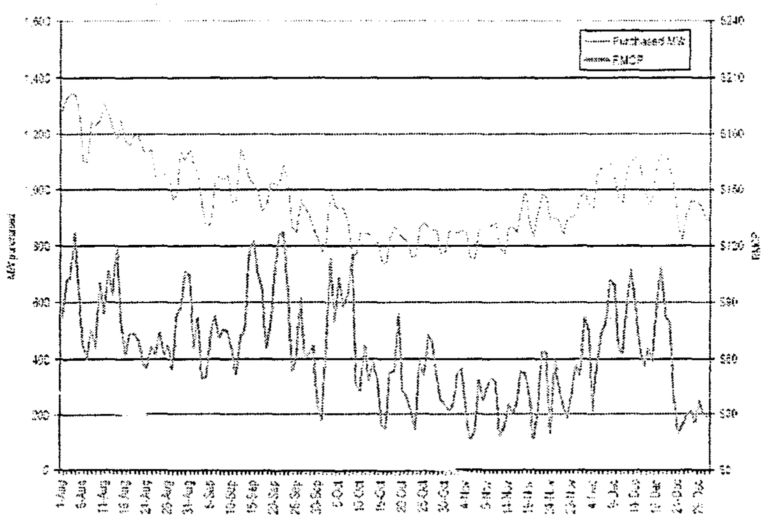


**Figure 0-7 PJM Combined Regulation Market daily regulation MW purchased vs. price per MW: Phase 5-b <H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\ RegMWPurch_vs_Price.xls (tab: RTOgraph)>>**




Important exceptions to this general pattern occurred periodically in the Western Region after the integration of Dominion on May 1, 2005. (See Figure 0-6.) An hourly analysis of regulation MW purchased versus the regulation price reveals some extreme exceptions that resulted from deficits during off-peak hours and/or times of minimum generation events. A shortage of regulation-capable units (as existed in the Western Region in early May) combined with a minimum generation event required expensive combustion turbine units to be started to satisfy regulation requirements resulting in high clearing prices. Minimum generation events can cause shortages of regulation in the PJM Mid-Atlantic Region as well, but since the regulation requirement in the PJM Mid-Atlantic Region is lower during off-peak hours it is less likely. Overall, the inflexibility of demand and the shortage of available regulating units caused relatively wide price swings in the Western Region during Phase 5-a.

As Figure 0-5, Figure 0-6 and Figure 0-7 also show, regulation prices during calendar year 2005 were seasonally higher in January, remained lower and relatively stable from February through April, then began to increase and show high daily variability into October before moderating at the end of the year. The higher average summer prices reflect higher LMPs in the LOC portion of the marginal unit's RMCP for regulation. (See Figure 0-2, Figure 0-3 and Figure 0-4.) During a period of low prices, March and April, the LOC/RMCP ratio was 42 percent for the PJM Mid-Atlantic Region and 58 percent for the Western Region. During a period of high prices, August and September, the LOC/RMCP ratio was 83 percent for the PJM Combined Regulation Market.

Figure 0-8 illustrates the level of demand for regulation by month in 2005 and the corresponding level of regulation cost.

**Figure 0-8 Monthly regulation MW and regulation cost per MW: Calendar year 2005 <J:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\CostPerMW_Monthly.xls (tab: graph)>**

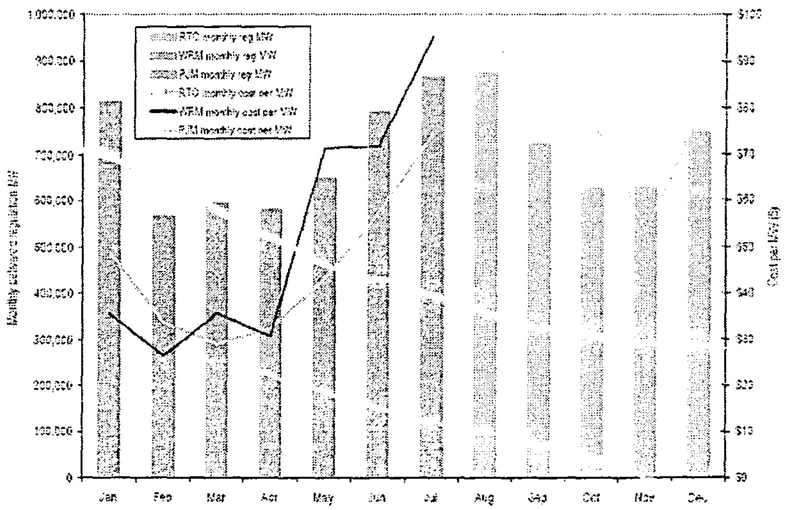
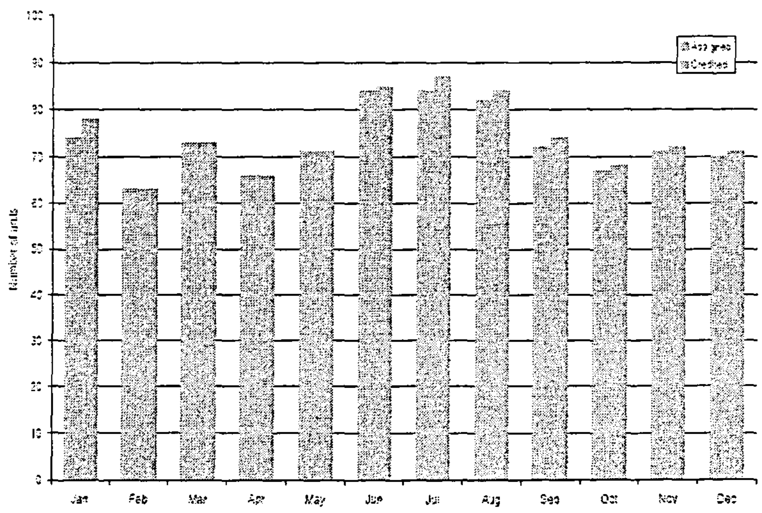


Figure 0-9 shows the average number of units per hour required to satisfy PJM's regulation requirement.

**Figure 0-9 Average hourly count of distinct units required to satisfy regulation requirement: Calendar year 2005 < J:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\UnitCount.xls (tab: UnitCountgraph)> >**



Units which provide regulation are paid the higher of the RMCP or their offer plus their unit-specific opportunity cost. In a perfect market all units would be compensated at RMCP times output. Sometimes, however, circumstances require that units be paid their offer plus their unit-specific oppo rtunity cost. Examples include units that must be redispatched because of constraints, unanticipated performance problems, or changes in the real-time LMP and, therefore, opportunity cost from the value estimated at regulation market-clearing 30 minutes prior to the operating hour. For these reasons some units are paid the value of their offer plus their unit-specific lost opportunity costs when that sum is higher than the RMCP. This means that PJM's regulation cost per MWh is somewhat higher than the RMCP. Figure 0-10 and Figure 0-11 compare the regulation cost per MWh with the regulation clearing price to show the difference between the price of regulation and the total cost of regulation.

**Figure 0-10 PJM Western Region Regulation Market daily average RMCP vs. cost per MW for regulation: Phases 4 and 5-a <J:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\CostVsPrice.xls (tab: PJMWRMgraph)>**

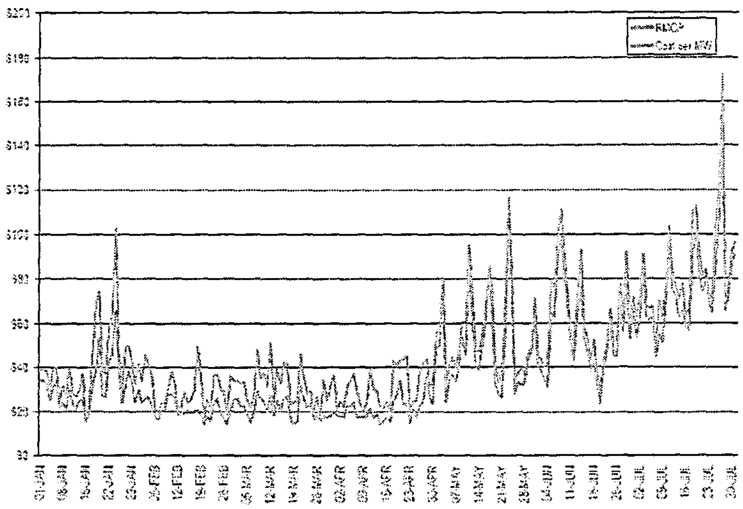
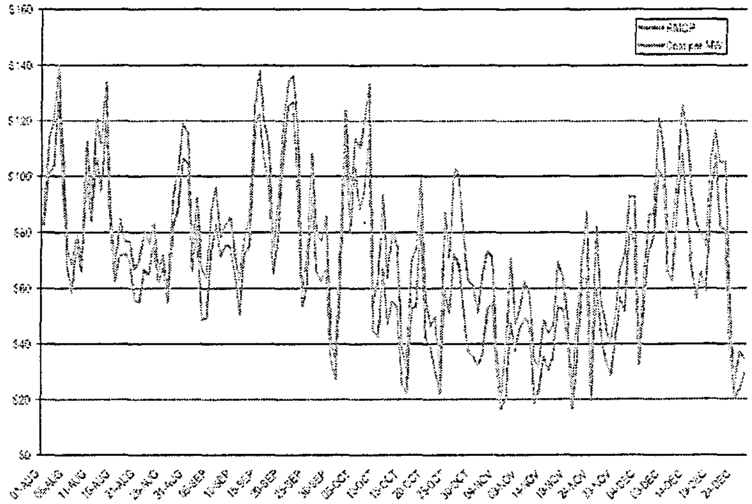


**Figure 0-11 PJM Combined Regulation Market daily average RMCP vs. cost per MW for regulation: Phase 5-b <J:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\CostVsPrice.xls (tab: RTOgraph)>**



## *Spinning Reserve Markets*

### Spinning Reserve Market Structure

The integration of Dominion on May 1, 2005, resulted in the creation of a Southern Region Spinning Reserve Market. Thus the PJM Spinning Reserve Markets include the PJM Mid-Atlantic Region Spinning Reserve Market, the Western Region Spinning Reserve Market, the ComEd Region Spinning Reserve Market and the Southern Region Spinning Reserve Market.

### Demand

Tier 2 spinning requirements are determined by subtracting the amount of forecast Tier 1 spinning reserve available from each spinning control area spinning reserve requirement for the period. The total spinning reserve requirement is different for each of the four regional Spinning Reserve Markets. For the Mid-Atlantic Region, the requirement is 75 percent of the largest contingency in the region, provided that 25 percent of the largest contingency is available as nonsynchronized, 10-minute reserve. For the ComEd Region, the requirement is 50 percent of the ComEd Control Zone's load ratio share of the largest contingency in the North American Electric Reliability Council's (NER C) Mid-America Interconnected Network, Inc. (MAIN) Region. From October 1 to December 3, 2004, this was 269 MW. After December 3, 2004, the ComEd

Control Zone's spinning requirement was 216 MW. For the Western Region, the requirement is 1.5 percent of the daily peak-load forecast. For the Southern Spinning Reserve Zone, the requirement is the Dominion Control Zone's load ratio share of the largest system contingency within the Virginia and Carolinas Area (VACAR), minus the available 15-minute quick start capability within the Southern Spinning Reserve Zone.

Computed in accordance with the requirements above, the average MW spinning requirement was: 1091 MW, for the PJM Mid-Atlantic Region; 217 MW for the ComEd Spinning Zone; 437 MW for the Western Region; and 5 MW for the Southern Spinning Reserve Zone (May to December only).

**Figure 0-12 PJM Mid-Atlantic Spinning Region average hourly required spinning vs. Tier 2 spinning purchased: Calendar year 2005 <<H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Spinning Required vs Tier 2 Purchased.xls (tab: PJM)>>**

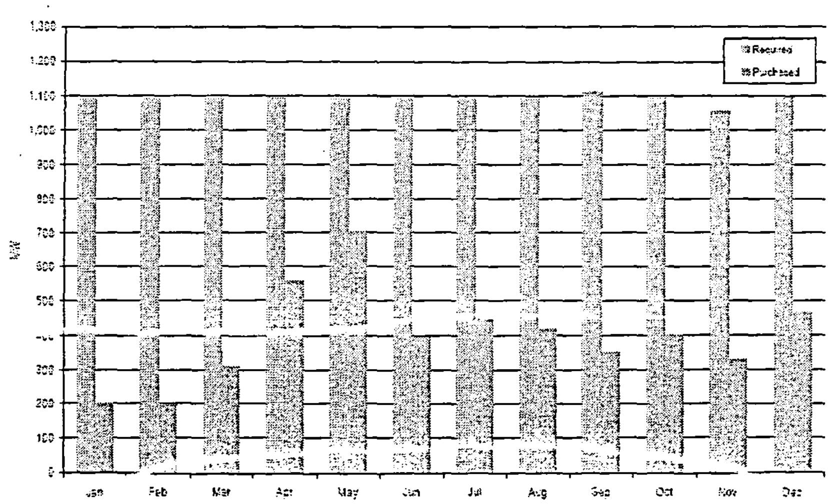


**Figure 0-13 PJM ComEd Spinning Region average hourly required spinning vs. Tier 2 spinning purchased: Calendar year 2005 <H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Spinning Required vs Tier 2 Purchased.xls (tab: ComEd)>**

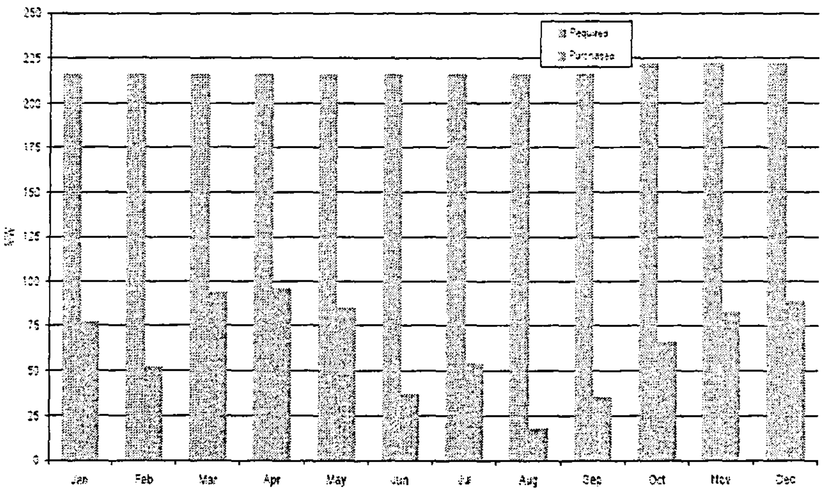
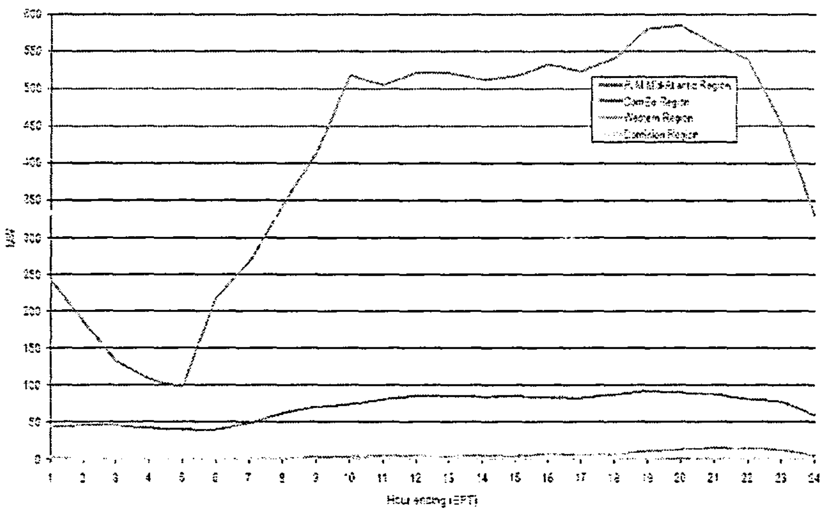


Figure 0-12 and Figure 0-13 show the average hourly spinning required and the average hourly Tier 2 spinning MW purchased during 2005 for the PJM Mid-Atlantic and ComEd Spinning Regions. Results for the Western Region Spinning Reserve Zone and the Southern Spinning Reserve Zone are not shown because Tier 2 spinning MW purchases were insignificant in those control areas during 2005. Spinning MW requirements are different for each of the four spinning regions in PJM. These differences are the result of specifications from local reliability councils, reserve-sharing arrangements with neighboring control areas and the types of generation available in the control area. The Southern Spinning Reserve Zone is a member of the VACAR subregion of NERC's Southeastern Electric Reliability Council (SERC). VACAR specifies that available 15-minute quick start reserve can be subtracted from the largest contingency to determine spinning reserve requirements. The amount of 15-minute quick start reserve available in VACAR is sufficient to make Tier 2 spinning requirements zero for most hours. Similarly, in the Western Region Spinning Reserve Zone most of the required spinning reserve is available as Tier 1 from large, frequently running baseload units, reducing its Tier 2 spinning requirement to zero in most hours. In both the PJM Mid-Atlantic and ComEd Spinning Regions the spinning reserve requirement is a function of the largest contingency. For the PJM Mid-Atlantic Region the hourly spinning requirement was usually 863 MW during off-peak hours and 1,150 MW during on-peak hours. Sometimes temporary grid conditions such as maintenance outages can cause double contingencies so there were times throughout the year when the on-peak spinning requirement was 1,380 MW. The average hourly Tier 2 spinning required for the PJM Mid-Atlantic Region was 1,091 MW. In the ComEd Region, the hourly requirement was 216 MW from January through September and 222 MW from October through December. Figure 0-12 and Figure 0-13 illustrate monthly average of the spinning reserve requirement and the amount of Tier 2 spinning actually purchased. The difference between the required spinning and Tier 2 spinning purchased is the amount of Tier 2 spinning available. Figure 0-14 illustrates the amount of Tier 2 spinning purchased by hour of the day. The hour variability reflects differing spinning reserve requirements for off-peak and on-peak hours as well as different amounts of Tier 1 spinning available.

**Figure 0-14 Average hourly Tier 2 spinning MW purchased (By hour of day): Calendar year 2005 <<H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Spinning Tier 2 Credited Average MWs By Hour.xls (tab: graph)>>**



## Supply

Spinning reserve is an ancillary service defined as generation that is synchronized to the system and capable of producing output within 10 minutes. Spinning reserve can, at present, be provided by a number of sources, including steam units with available ramp, condensing hydroelectric units, condensing CTs and CTs running at minimum generation.

All of the units that participate in the Spinning Reserve Market are categorized as either Tier 1 or Tier 2 spinning. Tier 1 resources are those units that are online following economic dispatch and able to respond to a spinning event by ramping up from their present output. All units operating on the PJM system are considered potential Tier 1 resources, except for those explicitly assigned to Tier 2 spinning. Tier 2 resources include units that are backed down to provide spinning capability and condensing units synchronized to the system and available to increase output.

PJM introduced a market for spinning reserve on December 1, 2002. Before the Spinning Reserve Market, Tier 1 spinning reserve had not been compensated directly and Tier 2 spinning reserve had been compensated on a unit-specific, cost-based formula.

Under the Spinning Reserve Market rules, Tier 1 resources are paid when they respond to an identified spinning event as an incentive to respond when needed. Tier 1 spinning payments or credits are equal to the integrated increase in MW output above economic dispatch from each generator over the length of a spinning event, multiplied by the spinning energy premium less the hourly integrated LMP. The spinning energy premium is defined as the average of the five-minute LMPs calculated during the spinning event plus $50 per MWh.[21] All units called on to supply Tier 1 or Tier 2 spinning have their actual MW monitored. Tier 1 units are not penalized if their output fails to match their expected response as they are only compensated for their actual response. Tier 2 units assigned spinning by market operations are compensated whether or not they are actually called on to supply spinning so they are penalized if their MW output fails to meet their assignment.

There were significant changes to the geographic structure of PJM's Spinning Reserve Markets in 2005. In Phase 4, PJM had three Spinning Reserve Markets: the PJM Mid-Atlantic Spinning Reserve Zone, the Western Spinning Reserve Zone and the ComEd Spinning Reserve Zone. During Phase 4, the Western Spinning Reserve Zone was comprised of AP, AEP, DAY and DLCO Control Zones. In Phase 5, the Dominion Control Zone was integrated into PJM and became the Southern Spinning Reserve Zone. Dominion remained a separate Spinning Reserve Market because as a member of SERC it has distinct spinning reserve requirements and reserve-sharing agreements.

Under the Spinning Reserve Market rules, Tier 2 spinning resources are paid to be available as spinning reserve, regardless of whether the units are called upon to generate in response to a spinning event and are subject to penalties if they do not provide spinning reserve when called. The price for Tier 2 spinning resources is determined in a market for Tier 2 spinning resources. Several steps are necessary before the hourly Tier 2 Spinning Reserve Market is cleared. Ninety minutes prior to the start of the hour, PJM estimates the amount of Tier 1 reserve available from every unit; 60 minutes prior to the

21 See "PJM Manual 11: Scheduling Operations," Revision 23 (December 7, 2004), pp. 66-67.

start of the hour, self-scheduled Tier 2 units are identified. If spinning requirements are not met by Tier 1 and self-scheduled Tier 2 resources, then a Tier 2 clearing price is determined 30 minutes prior to the start of the hour. This Tier 2 price is equivalent to the merit-order price of the highest price, Tier 2 resource needed to fulfill spinning requirements, the marginal unit.[22]

The spinning offer price submitted for a unit can be no greater than the unit's operating and maintenance cost plus a $7.50 per MWh margin.[23, 24] The market-clearing price is comprised of the marginal unit's spinning offer price, the cost of energy use and the unit's opportunity cost. All units cleared in the Spinning Reserve Market are paid the higher of either the market-clearing price or the unit's spinning offer plus the unit-specific LOC and/or the cost of energy use incurred.

The Mid-Atlantic Region, the Western Region, the ComEd Region and the Southern Region Spinning Reserve Zones all operate under similar business rules. The Tier 2 Spinning Reserve Market in each of PJM's spinning reserve zones is cleared on cost-based offers because the structural conditions for competition do not exist. The structural issue can be more severe when the Spinning Reserve Market becomes local because of transmission constraints.

## Concentration of Ownership

The offered and eligible Tier 2 Spinning Reserve Markets for all four geographic markets are highly concentrated. (See Figure 0-15.) During calendar year 2005, in the Mid-Atlantic Region average HHI for offered Tier 2 spinning was 2167 and 2940 for eligible spinning. In the ComEd Region during 2005 the average HHI for offered spinning was 6305 and 8844 for eligible spinning. In the Western Region the average HHI for offered spinning was 4173 and 4593 for eligible spinning. In the Southern Region the HHI was 10000.

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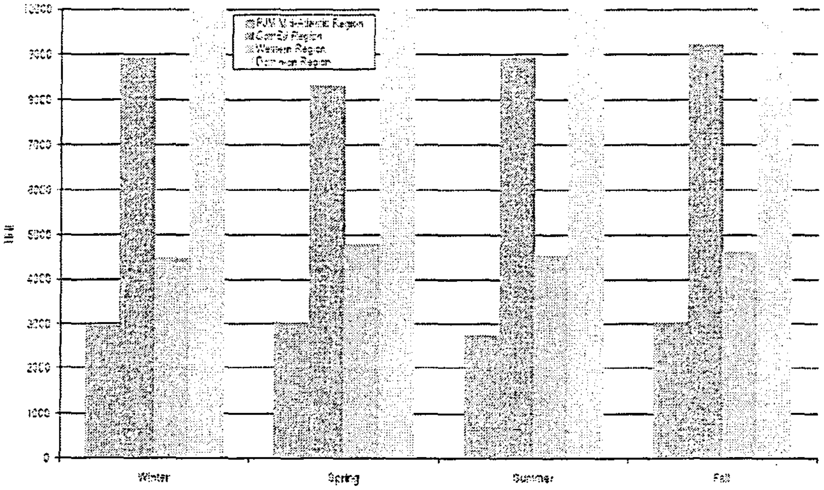
22 Although it is unusual, a PJM dispatcher can deselect units which have been committed after the clearing price is established. This only happens if real-time system conditions require dispatch of a spinning unit for constraint control, or problems with a generator or monitoring equipment are reported.

23 See "PJM Manual 11: Scheduling Operations," Revision 23 (December 7, 2004), p. 58.

24 See "PJM Manual 15: Cost Development Guidelines," Revision 4, (September 1, 2004), p. 31.

**Figure 0-15 Eligible Spinning Reserve Market HHI: Calendar year 2005 << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Spinning Tier2 Eligible HHIs FCS.xls (tab:graph)>>**



## Spinning Reserve Market Performance

### Spinning Reserve Offers

Figure 0-16 shows the daily average hourly offered Tier 2 spinning. Figure 0-17 shows the daily average hourly eligible Tier 2 spinning. Daily Tier 2 spinning offers are fairly stable reflecting the Tier 2 spinning capability of the units, other unit attributes and economic decisions by sellers. The level of eligible spinning displays considerable variability because it is calculated hourly and reflects current market and grid conditions, including LMP, unit dispatch and system constraints.

**Figure 0-16 Tier 2 spinning offered MW: Calendar year 2005 << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Spinning Tier 2 Offered MWs and Offered $ per MWh Daily.xls (tab: Offered MW Graph>>**

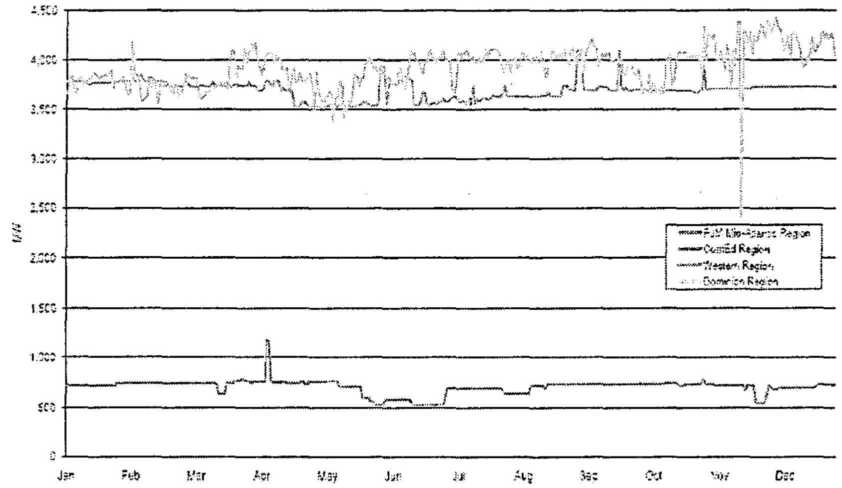


**Figure 0-17 Tier 2 spinning eligible MW: Calendar year 2005 << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\ Spinning Tier 2 Eligible MWs and Eligible $ per MWh Daily.xls>>**

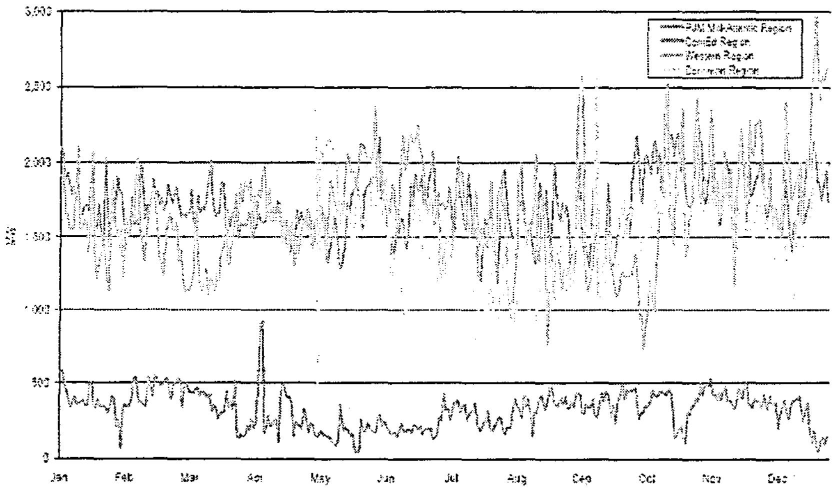
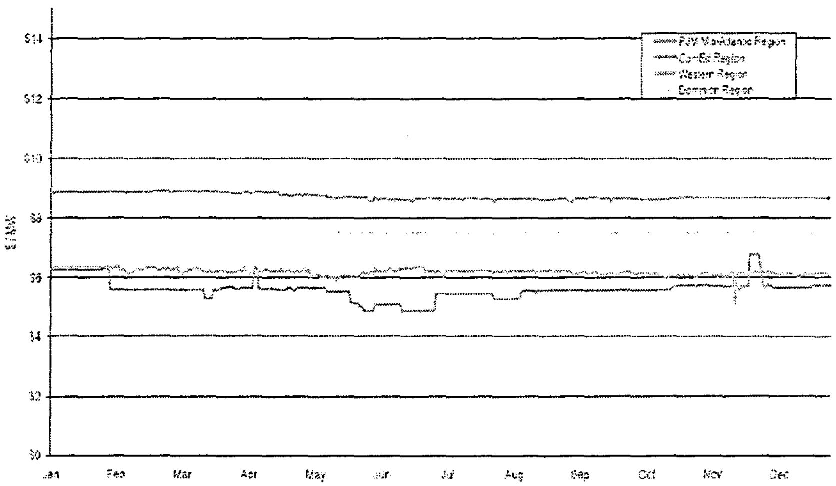


Figure 0-18 shows average offer price per MW by ancillary service area. Tier 2 spinning offers are capped at $7.50 plus costs. The clearing price for Tier 2 spinning includes lost opportunity costs based on LMP, energy use, and operating costs for units which are actually assigned Tier 2 spinning. (See Figure 0-19.)

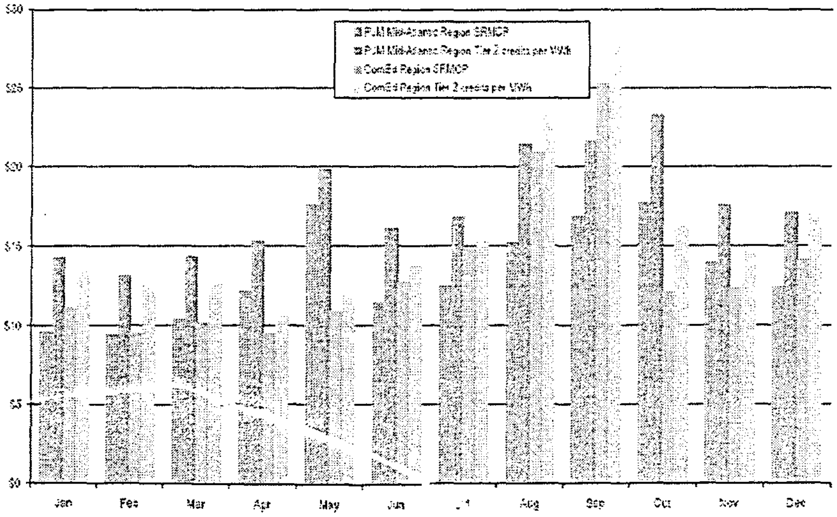
**Figure 0-18 Tier 2 spinning average offer price per MW: Calendar year 2005 << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\ Spinning Tier 2 Offered MWs and Offered $ per MWh Daily.xls (tab: Offered $ per MW graph>>**




## Spinning Reserve Prices

Figure 0-19 shows the average spinning reserve market-clearing price (SRMCP) and the cost per MW associated with meeting PJM demand for spinning reserve. The average PJM Mid-Atlantic Region SRMCP rose in 2005 to $13.29. The cost per MW of meeting the spinning reserve requirements also rose to approximately $17.59 per MWh. In the ComEd Region, the average SRMCP was $13.64 and the cost per MW for meeting the spinning reserve requirement was $15.85. No price data are presented for the Western Region Spinning Reserve Market because there was almost always adequate Tier 1 spinning reserve to meet the requirements for spinning reserve without clearing the Tier 2 market.

**Figure 0-19 Tier 2 spinning market-clearing price and cost per MW: Calendar year 2005 << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\ Spinning Tier 2 Credits Per MWh Daily Versus Average SRMCP.xls (tab: graph)>>**




The Western Region Spinning Reserve Market (not shown in Figure 0-19) during 2005 almost never had a clearing price because available Tier 1 spinning was always sufficient to cover the spinning requirement. For the 311 hours between June and December when a Spinning Reserve Market was cleared in the Western Region, the average clearing price was $12.27 and the cost of spinning was $66.75 per MWh. The Southern Region (not shown in Figure 0-19) was cleared only 18 hours between June 1 and December 31 with an average SRMCP of $11.34 and an average cost per MWh for Tier 2 spinning of $35.10.

Like Regulation Market prices, Tier 2 spinning reserve prices are more reflective of costs associated with the marginal unit than they are of offer prices. Unlike regulation, however, the costs in Tier 2 spinning are more than just opportunity costs; they are also energy costs for condensing MWh (which must be purchased from the Real-Time Energy Market when the unit is spinning), and startup costs if the assigned unit is not already running. Figure 0-20 and Figure 0-21 shows the relationship between the marginal unit's offer price and the SRMCP. For the PJM Mid-Atlantic Region during all of 2005 the Tier 2 spinning offer price averaged 67 percent of the SRMCP.

**Figure 0-20 PJM Mid-Atlantic Region Tier 2 spinning reserve clearing prices and marginal unit offer price: Calendar year 2005 << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\ SpinPriceLOC_final.xls (tab: PJMPriceLOCgraph)>>**

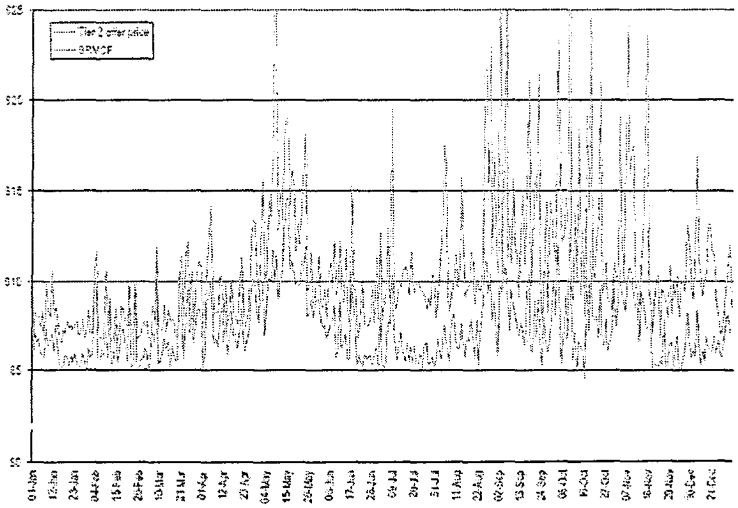


Figure 0-21 shows the relationship between the marginal units' offer price and the SRMCP for the ComEd Region. For the ComEd Region during all of 2005, the Tier 2 spinning offer price averaged 51 percent of the SRMCP.



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**Figure 0-21 PJM ComEd Tier 2 spinning reserve clearing prices and marginal unit offer price: Calendar year 2005 << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\ SpinPriceLOC_final.xls (tab: ComEDPriceLOCgraph)>>**

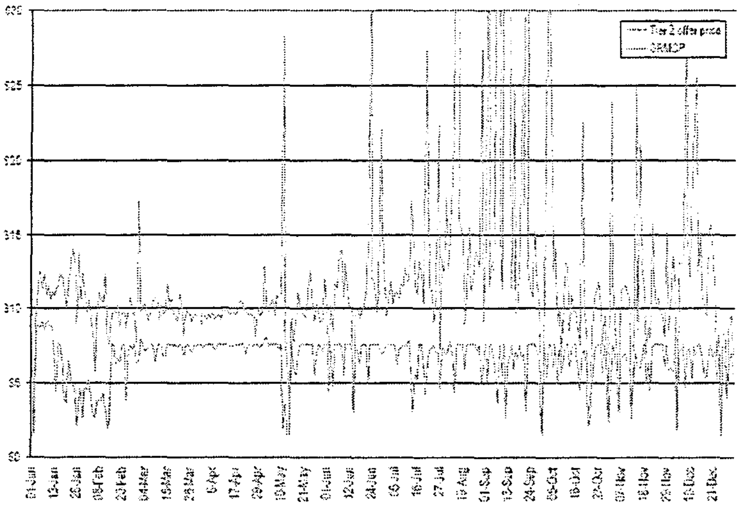
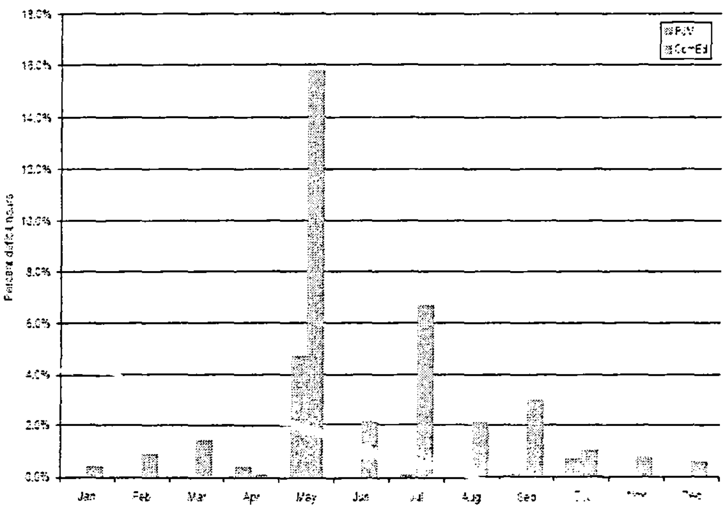


Figure 0-21 sho ws the level of Tier 1 and Tier 2 spinning reserve purchased from suppliers during calendar year 2005. Tier 1 resources are paid only if they respond during spinning events while Tier 2 resources are paid for providing hourly reserve. In general, more Tier 2 resources are purchased than Tier 1 resources, and Tier 2 payments are higher than Tier 1 payments. An important exception to this general rule was in the Western Region Spinning Reserve Market where a large baseload of available operating reserves ensures that Tier 1 spinning reserve services were almost always sufficient to cover the spinning requirement so Tier 2 spinning reserve was rarely purchased.

## Spinning Reserve Availability

A spinning reserve deficit occurs when the combination of Tier 1 and Tier 2 spinning is not adequate to meet the spinning reserve requirement. Except for a brief period in the ComEd Region during May (See Figure 0-22.), none of PJM's Spinning Reserve Markets had significant spinning reserve deficits during 2005.

**Figure 0-22 Tier 2 Spinning Reserve Market deficits: Calendar year 2005 <<J:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\DeficitResults.xls (tab: DeficitResultsGraph)>>**




The Tier 2 spinning deficit peak during May in the ComEd Region was caused indirectly by a need for regulation and the assignment of several CTs, which otherwise provided spinning reserve to regulation. None of these Tier 2 spinning deficits created a serious problem because the ComEd Region's reserve requirement was satisfied by a reserve-sharing agreement with other members of MAIN.

## Ancillary Service Markets

The United States Federal Energy Regulatory Commission (FERC) defined six ancillary services in Order 888: 1) scheduling, system control and dispatch; 2) reactive supply and voltage control from generation services; 3) regulation and frequency response services; 4) energy imbalance service; 5) operating reserve -- spinning reserve services; and 6) operating reserve -- supplemental reserve services.[1] Of these, PJM currently provides regulation, energy imbalance and spinning reserve services through market-based mechanisms. PJM provides energy imbalance service through the Real-Time Energy Market. PJM provides the remaining ancillary services on a cost basis.

Regulation matches generation with very short-term changes in load by moving the output of selected generators up and down via an automatic control signal.[2] Regulation is provided, independent of economic signal, by generators with a short-term response capability (less than five minutes). Longer term deviations between system load and generation are met via primary and secondary reserves and generation responses to economic signals. Spinning reserve is a form of primary reserve. To provide spinning a generator must be synchronized to the system and capable of providing output within 10 minutes.

Both the Regulation and Spinning Reserve Markets are cleared on a real-time basis. A unit can be selected for either spinning reserve or regulation or neither, but it cannot be selected for both. The Regulation and Spinning Reserve Markets are cleared simultaneously and cooptimized with the Energy Market and operating reserve requirements to minimize the cost of the combined products.

PJM does not provide a market for reactive power, but does ensure its adequacy through member requirements and scheduling.[3] Generation owners are paid according to the FERC-approved reactive revenue requirements. Charges are allocated to network customers based on their percentage of load, as well as to point-to-point customers based on their monthly peak usage.

During the last two calendar years, PJM has integrated five control zones. In the *2004 State of the Market Report* the calendar year was divided into three phases, corresponding

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1 75 FERC ¶ 61,080 (1996).

2 Regulation is used to help control the area control error (ACE). See Appendix F, "Ancillary Service Markets," for a full definition and discussion of ACE.

3 See "PJM Manual for Scheduling Operations, M-11," Revision 25 (August 19, 2005), p. 71.

to market integration dates. In the *2005 State of the Market Report* the calendar year is divided into two phases, also corresponding to market integration dates:[4]

- **Phase 1 (2004).** The four-month period from January 1 through April 30, 2004, during which PJM was comprised of the Mid-Atlantic Region, including its 11 zones,[5] and the Allegheny Power Company (AP) Control Zone.[6]

- **Phase 2 (2004).** The five-month period from May 1 through September 30, 2004, during which PJM was comprised of the Mid-Atlantic Region, including its 11 zones, the AP Control Zone and the Commonwealth Edison Company Control Area (ComEd).[7]

- **Phase 3 (2004).** The three-month period from October 1 through December 31, 2004, during which PJM was comprised of the Mid-Atlantic Region, including its 11 zones, the AP Control Zone and the ComEd Control Zone plus the American Electric Power Control Zone (AEP) and The Dayton Power & Light Company Control Zone (DAY). The ComEd Control Area became the ComEd Control Zone on October 1.

- **Phase 4 (2005).** The four-month period from January 1 through April 30, 2005, during which PJM was comprised of the Mid-Atlantic Region, including its 11 zones, the AP, ComEd, AEP and DAY Control Zones plus the Duquesne Light Company (DLCO) Control Zone which was integrated into PJM on January 1, 2005.

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4 See the *2004 State of the Market Report* for more detailed descriptions of Phases 1, 2 and 3.

5 The Mid-Atlantic Region is comprised of the Atlantic Electric Company Control Zone (AECO), the Baltimore Gas & Electric Control Zone (BGE), the Delmarva Power & Light Control Zone (DPL), the Jersey Central Power & Light Company Control Zone (JCPL), the Metropolitan Edison Company Control Zone (Met-Ed), the PECO Energy Company Control Zone (PECO), the Pennsylvania Electric Company Control Zone (PENELEC), the Pepco Control Zone (PEPCO), the PPL Electric Utilities Corporation Control Zone (PPL), the Public Service Electric and Gas Company Control Zone (PSEG) and the Rockland Electric Company Control Zone (RECO).

6 Zones, control zones and control areas are geographic areas that customarily bear the name of a large utility service provider operating within their boundaries. Names apply to the geographic area, not to any single company. The geographic areas did not change with the formalization of the control zone and control area concepts during PJM's Phase 3 integrations. For simplicity, zones are referred to as control zones for all three phases. The only exception is ComEd which is called the ComEd Control Area for Phase 2 only.

7 During the five-month period May 1, 2004, through September 30, 2004, the ComEd Control Zone (ComEd) was called the Northern Illinois Control Area (NICA).

- **Phase 5 (2005).** The eight-month period from May 1 through December 31, 2005, during which PJM was comprised of the Phase 4 elements plus the Dominion Control Zone which was integrated into PJM on May 1, 2005.

In both Phase 4 and Phase 5, PJM operated two Regulation Markets: one for the Mid-Atlantic Region and a second for the Western Region. On August 1 of Phase 5, PJM combined both into a single PJM Combined Regulation Market for a six-month trial period. After the trial period, based on analysis of market results and a report by the PJM Market Monitoring Unit (MMU), PJM stakeholders will vote on whether to keep the combined market.

During Phase 4, PJM operated three Spinning Reserve Markets: one for the Mid-Atlantic Region, one for the Western Region and one for the ComEd Control Zone. During Phase 5, PJM operated a fourth Spinning Reserve Market for Dominion.

The analysis treats each of the two Regulation Markets and each of the three Spinning Reserve Markets separately during Phase 4. The market analysis treats each of the two Regulation Markets separately during the May 1 through July 31 component of Phase 5 (Phase 5-a), and as a single Regulation Market during the August 1 through December 31 component of Phase 5 (Phase 5-b). Each of the four Spinning Reserve Markets is treated separately for the entire Phase 5 period.

## *Overview – Regulation and Spinning Reserve Markets*

The MMU has reviewed structure, conduct and performance indicators for the identified Regulation Markets. The MMU concludes that the Regulation Markets functioned effectively, except for some minor problems of insufficient regulation supply shortly after the start of Phase 5 and during times of minimum generation. The Regulation Markets produced competitive results throughout calendar year 2005 based on the regulation market-clearing price. The Regulation Market prices reflected the fact that offers in the Western Region were capped during Phase 4 and that the offers of two large participants, AEP and Dominion, were capped at cost plus a margin throughout Phase 5, in both cases because the Western Region Regulation Market was determined to be not structurally competitive.

The MMU has reviewed structure, conduct and performance indicators for the identified Spinning Reserve Markets. The MMU concludes that the Spinning Reserve Markets functioned effectively. The Spinning Reserve Markets produced competitive results throughout calendar year 2005 based on the spinning market-clearing price. The Spinning Reserve Market prices reflected the fact that all offers were capped at cost plus a margin because the markets have been determined to be not structurally competitive.

## The Regulation Markets

The structure of the Mid-Atlantic Region and Western Region Regulation Markets was evaluated and the MMU concluded that these markets are not structurally competitive as they are characterized by a combination of one or more structural elements including high levels of supplier concentration, high individual company market shares, significant hours with pivotal suppliers and inelastic demand. The structure of the Combined Regulation Market was also evaluated based on the five months of available data and the MMU concluded that this market is characterized by lower levels of concentration, smaller market shares, a smaller number of hours with pivotal suppliers and inelastic demand. The conduct of market participants within these market structures has been consistent with competition consistent with existing offer capping, and the market performance results have been competitive.

- **Mid-Atlantic Region.** The Regulation Market in the PJM Mid-Atlantic Region was cleared based on participants' price offers during Phases 4 and 5-a. All suppliers were paid the market-clearing price, which is a function of the supply curve and PJM-defined demand. The supply curve consists of offered and eligible MW and the associated offer prices which are a combination of unit-specific offers plus opportunity cost (OC) as calculated by PJM.[8]

- **Western Region.** The Regulation Market in the Western Region during Phase 4 was cleared based on participants' cost-based offers. The cost-based regulation offers are defined to be the unit-specific incremental cost of providing regulation plus a margin of $7.50 per MWh plus opportunity cost calculated by PJM. During Phase 5-a, the market was cleared using a combination of price-based offers and cost-based offers. In Phase 5, Dominion and AEP were required to make cost-based offers based on their dominant position in the market while other participants made price offers.

- **PJM Combined Regulation Market.** During the trial period for the PJM Combined Regulation Market, the market was cleared using a combination of price-based offers and cost-based offers. Dominion and AEP were required to make cost-based offers based on their dominant position in the market while other participants made price offers.

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8 As used here, the term, "opportunity cost" (OC), refers to the estimated lost opportunity cost (LOC) that PJM uses to create a supply curve on an hour-ahead basis. The term, "lost opportunity cost," refers to opportunity costs included in payments to generation owners.

## Market Structure

- **Demand.** Demand for regulation is determined by PJM based on an evaluation of the regulation required in order to meet reliability objectives. Required regulation remained constant for each control region throughout 2005 except for two periods during which a temporary adder was implemented at the direction of PJM.

- **Supply.** The supply of offered and eligible regulation in the PJM Mid-Atlantic Region was generally both stable and adequate, with an average 1.92 ratio of regulation supply offered and eligible to the hourly regulation requirement during Phases 4 and 5-a. While the average ratio of hourly regulation supply offered and eligible to regulation required was 1.64 for the Western Region during Phases 4 and 5-a, at times an inadequate supply of regulation was offered and eligible to participate in the market on an hourly basis in the Western Region. The average ratio of hourly regulation supply offered and eligible to regulation required was 1.88 for the PJM Combined Regulation Market during Phase 5-b.

### *Concentration of Ownership*

- **Mid-Atlantic Region.** During Phase 4 and Phase 5-a, the PJM Mid-Atlantic Region Regulation Market for eligible regulation had an average Herfindahl-Hirschman Index (HHI)[9] of 1751 which is classified as "moderately concentrated."[10] Less than 1 percent of the hours had an eligible regulation HHI above 2500. There were two suppliers with market shares greater than, or equal to, 20 percent. Seven percent of the hours had a single pivotal supplier, 48 percent of the hours had two pivotal suppliers and 88 percent of the hours had three pivotal suppliers.

- **Western Region.** During Phase 4 and Phase 5-a, the Western Region Regulation Market for eligible regulation had an average HHI of 2802 which is classified as "highly concentrated" and 58 percent of the hours had an HHI above 2500. There was a single pivotal supplier in 62 percent of the hours. One hundred percent of the hours had two pivotal suppliers.

- **PJM Combined Regulation Market.** During Phase 5-b, the PJM Combined Regulation Market had an average HHI of 1079 which is classified as

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9 See Section 2, "Energy Market, Part I," at "Market Concentration" for a more complete discussion of concentration ratios and the Herfindahl-Hirschman Index (HHI).

10 The market structure metrics reported in this summary are based on regulation capacity that is both offered to the market and is eligible to provide regulation.

"moderately concentrated." No suppliers had market shares greater than, or equal to, 20 percent. During 1 percent of hours, there was a single pivotal supplier. During 6 percent of hours, there were two pivotal suppliers. During 29 percent of the hours, there were three pivotal suppliers. For all units except CTs, during 5 percent of hours, there was a single pivotal supplier, during 23 percent of hours, there were two pivotal suppliers and during 68 percent of the hours, there were three pivotal suppliers.

## Market Conduct

- **Offers.** The offer price is the only component of the total regulation offer price provided by the unit owner and is applicable for the entire operating day. The regulation offer price is subject to a $100 per MWh offer cap in the Mid-Atlantic Region, was subject to offer capping in Phase 4 in the Western Region and was subject only to a $100 per MWh offer cap in Phase 5 in the Western Region, with the exception of the dominant suppliers, Dominion and AEP, whose offers were capped at marginal cost plus $7.50 per MWh plus opportunity cost. The average MW-weighted offer price for regulation in the PJM Mid-Atlantic Region during Phases 4 and 5-a was $15.63. The average MW-weighted offer price for regulation in the Western Region Regulation Market during Phases 4 and 5-a was $7.73. For the PJM Combined Regulation Market during Phase 5-b, the average MW-weighted offer price for regulation was $16.29.

## Market Performance

- **Price.** For the entire PJM regional transmission organization (RTO) from January 1, 2005, to December 31, 2005, the average price per MWh (regulation market-clearing price) associated with meeting PJM's demand for regulation was $49.73. For the PJM region during Phases 4 and 5-a, the average price per MWh for regulation was $36.39. For the Western Region Regulation Market during Phases 4 and 5-a, the average price per MWh for regulation was $42.64. For the PJM Combined Regulation Market during Phase 5-b, the average price per MWh was $64.03.

## The Spinning Reserve Markets

The structure of each of the Spinning Reserve Markets has been evaluated and the MMU has concluded that these markets are not structurally competitive as they are characterized by high levels of supplier concentration and inelastic demand. As a result, these markets are operated as markets with market-clearing prices and with offers based on the marginal cost of producing the service plus a margin and opportunity cost. The conduct of market participants within these market structures has been consistent with competition, and the market performance results have been competitive. Prices for spinning in the PJM Mid-Atlantic Region, the ComEd Control Zone, the Western Region

and Dominion are market-clearing prices determined by the supply curve and PJM-defined demand. The cost-based spinning offers are defined to be the unit-specific incremental cost of providing spinning reserve plus a margin of $7.50 per MWh plus opportunity cost calculated by PJM.

## Market Structure

- **Demand.** Computed in accordance with the specific spinning reserve requirements, the average MW spinning requirement was: 1,091 MW, for the PJM Mid-Atlantic Region; 217 MW for the ComEd Spinning Zone; 437 MW for the Western Region; and 5 MW for the Southern Spinning Reserve Zone (May to December only).

- **Supply.** For the PJM Mid-Atlantic Region, the offered and eligible excess supply ratio was 1.15. For the Western and Southern Regions, the ratio was 1.76. For the ComEd Control Zone, the ratio was 1.21.

- **Concentration of Ownership.** In 2005, market concentration was high in the Tier 2 Spinning Reserve Market. The average offered and eligible Spinning Reserve Market HHI for the PJM Mid-Atlantic Region throughout 2005 was 2940. The average Spinning Reserve Market HHI for the Western Region was 4593. The average Spinning Reserve Market HHI for ComEd Control Zone was 8844. The average Spinning Reserve Market HHI for Dominion was 10000.

## Market Performance

- **Price.** Load-weighted, average price associated with meeting the PJM system demand for Tier 2 spinning reserve throughout 2005 was $14.41 per MW, a $0.45 per MW decrease from 2004. The load-weighted, average price in the PJM Mid-Atlantic Region for Phases 4 and 5 was $15.44 per MW. The load-weighted, average price for spinning reserve in the ComEd Control Zone during Phases 4 and 5 was $12.73. The load-weighted, average price for spinning in the Western Control Zone during Phases 4 and 5 was $13.23. The load-weighted, average price for spinning in Dominion during Phase 5 was $13.08.

## Conclusion

PJM consolidated its Regulation Markets into a single Combined Regulation Market, on a trial basis, effective August 1, 2005. PJM's consolidation of its Regulation Markets resulted in improved performance and in increased competition. The MMU will make a recommendation in the near future as to whether the consolidation has resulted in a market that is structurally competitive. The market continues to be based on price offers for most sellers and all sellers are paid a market-clearing price based on offers plus opportunity costs. The result of this design has been a competitive outcome and consistent with competitive offers from all participants whether offer-capped or not. The marginal costs of providing regulation have been clearly defined and are consistent with the offers that would be made if the suppliers were behaving competitively.

PJM's Spinning Reserve Markets have worked effectively with offers based on marginal costs plus a margin and with all participants paid a market-clearing price based on the marginal offer including opportunity costs, despite the fact that these markets are characterized by high levels of seller concentration and inelastic demand.

The benefits of markets are realized under this approach to ancillary service markets. Even in the presence of structurally non-competitive markets, there are transparent, market-clearing prices based on competitive offers that account explicitly and accurately for opportunity costs. PJM should continue to consider whether additional ancillary service markets need to be defined in order to ensure that the market is compensating suppliers for services when appropriate.

## *Regulation Markets*

### Regulation Market Structure

Two major changes affected the structure of the Regulation Market in 2005. The first was the integration of Dominion into the Western Region Regulation Market on May 1, 2005. The second was the implementation of the PJM Combined Regulation Market on August 1, 2005.

### Demand

Demand for regulation does not change with price (is price inelastic). The demand for regulation is set administratively based on reliability objectives and forecast load. Regulation demand will be referred to in this report as required regulation.

The PJM Mid-Atlantic Region has different regulation requirements for on-peak hours and off-peak hours. The regulation requirement for the peak period is 1.1 percent of the peak-load forecast; for the off-peak period, it is 1.1 percent of the valley-load forecast.[11] During Phases 4 and 5-a, PJM Mid-Atlantic Region regulation requirements ranged from 226 MW of regulation capability for off-peak periods to 649 MW for on-peak periods. The average required regulation was 434 MW.

In the Western Region, the regulation requirement was 1.0 percent of the peak forecast load and did not vary between on-peak and off-peak periods. During Phases 4 and 5-a, the requirement ranged from 320 MW to 771 MW, averaging 517 MW.

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11 See "PJM Manual for Scheduling Operations, M-11," Revision 25 (August 19, 2005), p. 51.

During Phase 5-b, the PJM Mid-Atlantic Region and the Western Region Regulation Markets were combined into the PJM Combined Regulation Market. The regulation requirement for this combined market was defined to equal the sum of the separate regulation requirements for each region. During Phase 5-b, the regulation requirement ranged from 662 MW to 1,404 MW, averaging 978 MW.

Although the required regulation specification remained constant for each control region throughout 2005, a temporary adder was implemented at the direction of PJM for two periods. As a result, regulation was purchased in addition to the full regulation requirement. On October 23, 2004, in response to problems after the integration of the ComEd Control Zone into the Western Region, required regulation was increased by 75 MW for each regulation zone. This regulation adder was subsequently reduced until regulation was returned to its base requirement on February 11, 2005.

On April 15, 2005, in response to a persistent problem with frequency excursions, a 100 MW increment was added to the regulation demand for both the Mid-Atlantic and Western Regions. It was phased out and then eliminated on May 14, 2005. Table 0-1 contains a list of regulation adder amounts by date.

**Table 0-1 Temporary regulation adder: October 23, 2004, to May 15, 2005 << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\regulation adder table.xls (tab:regulation adder)>>**

| Regulation Adder Date | Change in Regulation MW per Control Zone | Total Regulation Adder (MW) per Control Zone |
|---|---|---|
| 23-Oct-04 | 75 | 75 |
| 29-Oct-04 | (75) | 0 |
| 1-Nov-04 | 75 | 75 |
| 11-Nov-04 | 100 | 175 |
| 17-Dec-04 | (50) | 125 |
| 7-Jan-05 | (25) | 100 |
| 14-Jan-05 | (25) | 75 |
| 26-Jan-05 | (25) | 50 |
| 4-Feb-05 | (25) | 25 |
| 11-Feb-05 | (25) | 0 |
| 15-Apr-05 | 100 | 100 |
| 6-May-05 | (25) | 75 |
| 8-May-05 | (75) | 0 |
| 12-May-05 | 50 | 50 |
| 14-May-05 | (50) | 0 |

The temporary additional regulation requirements between mid-April and mid-May reflected an effort by PJM to solve simultaneous problems of insufficient regulation in the Western Region Regulation Market, particularly during off-peak hours, and frequency excursions that impacted PJM's compliance requirement for CPS2.[12]

Regulation obligation is determined hourly for each load-serving entity (LSE) by applying the real-time load ratio share (adjusted for scheduled load responsibility) to the actual amount of regulation assigned for that hour adjusted for any bilaterals and self-supply. The hourly regulation charge for each LSE is equal to the hourly regulation market-clearing price (RMCP) multiplied by the MW of regulation purchased from the market, plus the LSE's percentage share of any opportunity cost incurred by generation owners over and above the RMCP, plus the LSE's percentage share of any unrecovered costs incurred by those units called on by PJM for the sole purpose of providing regulation.

## Supply

The supply of regulation can be measured as regulation capability, regulation offered, or regulation offered and eligible. For purposes of evaluating the Regulation Market, the relevant regulation supply is the level of supply that is both offered to the market on an hourly basis and is eligible to participate in the market on an hourly basis. This is the only supply that is actually considered in the determination of market prices. The level of supply that clears in the market on an hourly basis is called assigned regulation. Assigned regulation is selected from regulation that is both offered and eligible.

Regulation capability represents the total volume of regulation capability reported by resource owners based on unit characteristics.

Regulation offered represents the level of regulation capability actually offered to the PJM Regulation Market. Resource owners may offer those units with approved regulation capability into the PJM Regulation Market. PJM does not require a resource capable of providing regulation service to offer its capability to the market. Regulation offers may be submitted on a daily basis and these daily offers may be modified on an hourly basis.

Regulation offered and eligible represents the level of regulation capability actually offered to the PJM Regulation Market and actually eligible to provide regulation in an hour. Some regulation offered to the market is not eligible to participate in the Regulation Market as a result of identifiable offer parameters specified by the supplier. As an example, the regulation capability of a unit will be included in regulation offered

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12 See Appendix F, "Ancillary Service Markets," for additional information on area control error (ACE) control and control performance standard (CPS).

based on the daily offer and availability status, but that regulation capability will not be eligible in one or more hours because the supplier sets the availability status to unavailable for one or more hours of that same day. (The availability status of a unit may be set in both a daily offer and an hourly update table in the PJM market software.) As another example, the regulation capability of a unit will be included in regulation offered if the owner of a unit offers regulation, but that regulation capability will not be eligible if the owner sets the unit's economic maximum generation level equal to its economic minimum generation level. In that case, the unit cannot provide regulation and is not eligible to provide regulation. As another example, the regulation capability of a unit will be included in regulation offered but that regulation capability will not be eligible if the unit is not operating, unless the unit is a combustion turbine that meets specific operating parameter requirements.

Only those offers which are eligible to provide regulation in an hour are part of supply for that hour, and only those offers are considered for purposes of clearing the market. Regulation assigned represents those regulation resources selected through the regulation market-clearing mechanism to provide regulation service for a given hour.

While the average regulation supply-to-requirement ratio of offered regulation in the Western Region Regulation Market during Phase 5-a was generally adequate at 1.70, the situation was more complicated than the supply-to-requirement ratio indicates. Regulation capacity was always adequate in the sense that the total reported capability was adequate.[13] Occasionally, however, PJM dispatchers had to redispatch generation uneconomically to satisfy reliability requirements. PJM encountered some difficulty with insufficient regulation supply in the Western Regulation Zone during Phase 5-a. Shortly after the Dominion integration on May 1, 2005, there was at times an inadequate supply of regulation that was offered and eligible to participate in the market on an hourly basis. This situation was most acute in the Western Region Regulation Market in May 2005 during off-peak periods when market solutions resulted in deficits 13.6 percent of the time and occasional off-peak hourly price spikes. (See Figure 0-1.) These higher than normal deficits generally occurred during off-peak hours when regulation-capable units were unavailable to regulate because they were not operating. In May, PJM frequently operated under minimum generation conditions, especially during off-peak hours. The combination of a regulation deficit and minimum generation conditions required dispatchers to balance the need for more regulation with the need for less generation. Dispatchers at times chose to operate with regulation deficits. This situation improved during June (deficits in 5.3 percent of all periods) and was resolved in July when the deficit percentage returned to its overall Phases 4 and 5-a average.

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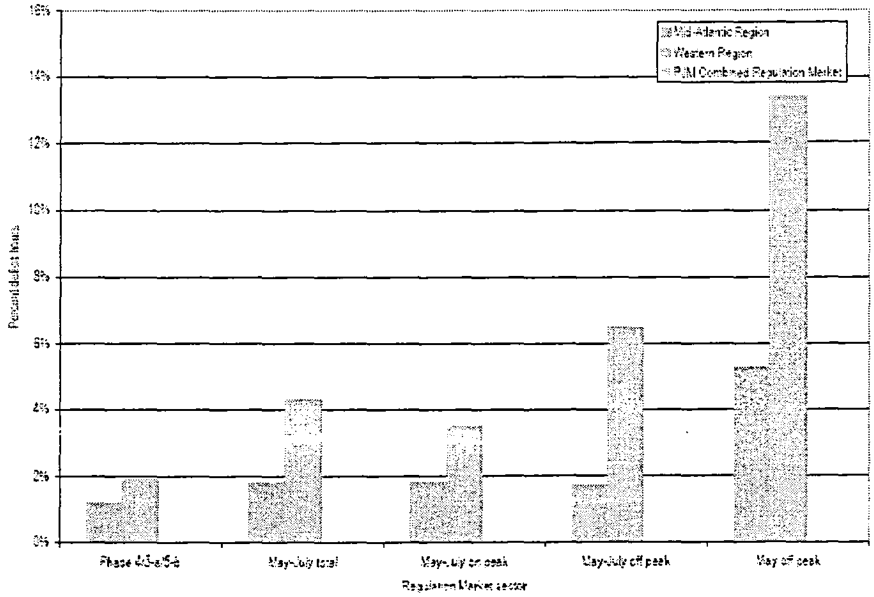
13 See "Regulation Capacity, Daily Availability, Hourly Supply and Price," in Appendix F, "Ancillary Service Markets," for a definition of capacity, availability and supply.

Figure 0-1 compares the percentage of regulation deficit hours across several Regulation Market periods, including all of 2005, Phase 5 only, off-peak and on-peak hours and off-peak hours in May. The abnormally high deficits that occurred in the Western Region particularly during off-peak hours in early May are clearly indicated.

**Figure 0-1 Regulation deficit analysis: Calendar year 2005 <<H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\deficit study.xls (tab:graph)>>**




Regulation deficits in the west were reduced during June and returned to normal in July. Also indicated in Figure 0-1 is the extent to which regulation deficits were all but eliminated after the PJM Combined Regulation Market. There was only one period of regulation deficit in the PJM Combined Regulation Market during Phase 5-b. This deficit does not show up in Figure 0-1 because the percentage of regulation deficit hours rounds to zero percent.

## Concentration of Ownership

### *Market Structure Definitions*

The market structure analysis follows the Commission logic specified in the AEP order.[14] The logic of the delivered price test is followed by calculating market share, HHI and pivotal supplier metrics for each market configuration.[15] The analysis presented here differs in two ways from the Commission's delivered price test. The delivered price test would start with the universe of regulation offered and eligible and then limit the analysis to those offered and eligible units that could provide regulation at less than or equal to 1.05 times the clearing price. The analysis here uses a proxy for the 1.05 times the clearing price definition used to define the relevant market. In PJM, the supply of regulation generally consists of two relatively distinct segments: an all units except combustion turbine (CT) segment (consisting of steam and hydroelectric units) and a CT segment. While steam, hydroelectric and CT units can and do provide regulation, the steam/hydroelectric segment is generally lower cost and is relatively homogeneous while the CT segment is generally significantly higher cost and similarly relatively internally homogeneous. Rather than directly applying the 1.05 times the clearing price market definition, the analysis here focuses separately on the steam/hydroelectric and the CT portions of the market. The steam/hydroelectric segment of the market is used in place of including only sellers that offer for a price less than or equal to the clearing price times 1.05 when a steam/hydroelectric unit is marginal, although the segment approach results in a substantially larger market definition. The CT segment is similarly used in place of including only sellers that offer for a price less than or equal to the clearing price times 1.05 when a CT unit is marginal, although again the segment approach probably results in a larger market definition. The data are presented including all units, all units except CTs (steam and hydroelectric) and CTs. In addition, the analysis here includes the results of the one, two and three pivotal supplier tests.

The analysis here includes all regulation provided by each supplier and made offered and eligible. While the market structure results are reported for regulation offered, this is not directly relevant to a determination of whether a market structure is competitive. Regulation must be both offered and eligible in an hour in order for it to be part of the market. This is termed economic capacity under the delivered price test.

The delivered price test may also be applied using available economic capacity, or gross supply by participant net of their load obligation. The fact that suppliers have load

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[14] *AEP Power Mktg. Inc.*, 107 FERC ¶ 61,018 ("AEP Order"), order on reh'g, 108 FERC ¶ 61,026 (2004).

[15] AEP Order at 105 *et seq.*

obligations may affect their incentives to exercise market power although not unambiguously. However, as the amount of load that will be served by the integrated utilities in the future is unknown given the unknown extent of retail competition, a reasonable approach is to evaluate the entire regulation supply, or economic capacity, as is done here.

The Commission's AEP order indicates that failure of any one of the specified tests is adequate for a showing of market power including tests based on market concentration, market share and pivotal supplier analyses. The analysis presented here goes further in order to analyze the significance of excess supply. The MMU applies the pivotal supplier test using one, two and three pivotal suppliers. In addition, when there are hours with one, two or three pivotal suppliers, the analysis also examines the frequency with which individual generation owners are in the pivotal group. If the hours that fail a pivotal supplier test have the same pivotal supplier(s) for a significant proportion of the hours, that information can be used to identify dominant suppliers.

The pivotal supplier tests represent an analytical approach to the issue of excess supply. Excess supply, by itself, is not necessarily adequate to ensure a competitive outcome. A monopolist could have substantial excess supply but the monopolist would not be expected to change its market behavior as a result. The same logic applies to a small group of dominant suppliers. However, if there is adequate supply without the three dominant suppliers to meet the demand, then the market can reasonably be deemed competitive.

### *PJM Mid-Atlantic Regulation Market – Phases 4 through 5-a*

During Phases 4 through 5-a, in the Regulation Market in the Mid-Atlantic Region, the offer capability was 2,408 MW.[16] The level of regulation resources offered on an hourly level and the level of regulation resources both offered and eligible to participate on an hourly level in the market were lower than the total regulation capability. In 2005 the average hourly offer level was 1,128 MW or 47 percent of offer capability while the average hourly eligible offer level was 835 MW or 35 percent of offer capability.

The ratio of the hourly regulation supply offered to the hourly regulation requirement, averaged 2.60 for the PJM Mid-Atlantic Region during Phases 4 and 5-a. When this ratio equals 1.0, it indicates that offered supply exactly equals demand for the referenced time period. Based upon regulation offered and eligible, this ratio averaged 1.92. The average regulation requirement for the PJM Mid-Atlantic Region during 2005 was 434 MW.

16 Offer capability is defined as the maximum daily offer volume for each offering unit during the period without regard to the actual availability of the resource.

Hourly HHI values were calculated based upon the regulation offered, regulation offered and eligible, and regulation assigned. Based upon regulation offered, HHI ranged from a maximum of 2064 to a minimum of 1088 with an average value of 1510. Based upon regulation offered and eligible, HHI values ranged from a maximum of 2787 to a minimum HHI of 1190, with an average value of 1751. Less than 1 percent of hours had an eligible regulation HHI above 2500. Based upon regulation assigned, HHI values ranged from a maximum of 9690 to a minimum HHI of 1118. The average HHI value for regulation assigned was 2260. Thirty-one percent of hours had an assigned regulation HHI above 2500. Table 0-2 summarizes the January 2005 through July 2005 PJM Mid-Atlantic Region Regulation Market HHIs.

**Table 0-2 PJM Mid-Atlantic Region Regulation Market hourly HHI: Phases 4 and 5-a< 14_Graphs_Tables\HHI_Tables.xls (Tab PJM HHIs) >**

| | Minimum | Average | Maximum | Percent Hours > 2500 |
|---|---|---|---|---|
| Offered | 1088 | 1510 | 2064 | 0% |
| Eligible | 1190 | 1751 | 2787 | 0% |
| Assigned | 1118 | 2260 | 9690 | 31% |

As noted above, regulation supply in PJM is bifurcated into the combustion turbine (CT) segment and the all units except CTs segment because, while some CTs provide regulation, they are very expensive to operate solely to provide regulation. In order to approximate the delivered price test approach, the Regulation Market HHI is reported with and without CTs. (See Table 3.) In the PJM Mid-Atlantic Region, HHIs are slightly lower without CTs because the CTs are disproportionately owned by the company with the largest market share.

**Table 3 PJM Mid-Atlantic Region Regulation Market hourly HHI (All units except CTs): Phases 4 and 5-a< 14_Graphs_Tables\PJMHHIResultsxls.xls (Tab NO_CTs) >**

| | Minimum | Average | Maximum | Percent Hours > 2500 |
|---|---|---|---|---|
| Offered | 1078 | 1475 | 2354 | 0% |
| Eligible | 1183 | 1718 | 2941 | 0% |
| Assigned | 1118 | 2266 | 9690 | 31% |

During Phases 4 and 5-a, two suppliers had market shares greater than, or equal to, 20 percent based on regulation offered and eligible. For the market segment excluding CTs, two suppliers had market shares greater than, or equal to, 20 percent based on regulation offered and eligible.

During Phases 4 and 5-a, 7 percent of the hours failed the single pivotal supplier test for offered and eligible supply in the PJM Mid-Atlantic Region's market.[17] This means that, during the seven-month period, for 7 percent of the hours the total regulation requirement could not be met in the absence of the largest supplier. Forty-eight percent of the hours failed the two pivotal supplier test. This means that, during 48 percent of the hours, the total regulation requirement could not be met in the absence of the two largest suppliers. Eighty-eight percent of the hours failed the three pivotal supplier test. This means that, during 88 percent of the hours, the total regulation the regulation requirement could not be met in the absence of the three largest suppliers.

For the market segment excluding CTs, the percentage of one pivotal supplier hours in the eligible Regulation Market increases from 7 percent to 10 percent, the percentage of two pivotal supplier hours increases from 48 percent to 52 percent and the percentage of three pivotal supplier hours increases from 88 percent to 89 percent. Table 0-4 summarizes the PJM Mid-Atlantic Region Regulation Market pivotal supplier statistics for Phases 4 and 5-a. The pivotal supplier statistics are also presented for all regulating units except CTs. (See Table 5.) Three companies are pivotal more than 75 percent of the three pivotal supplier intervals for all units, and for the all units except CTs segment.

**Table 0-4 PJM Mid-Atlantic Region Regulation Market pivotal supplier statistics: Phases 4 and 5-a< 14_Graphs_Tables\Piv Sup Tables.xls (Tab PJM PivSup) >**

| | Hours Offered (Percent) | Hours Eligible (Percent) |
|---|---|---|
| 1 pivotal | 0% | 7% |
| 2 pivotal | 3% | 48% |
| 3 pivotal | 35% | 88% |

**Table 5 PJM Mid-Atlantic Region Regulation Market pivotal supplier statistics (All units except CTs): Phases 4 and 5-a< 14_Graphs_Tables\PJMPivSupResultsxls.xls (Tab NonCTPivSupHours) >**

| | Hours Offered (Percent) | Hours Eligible (Percent) |
|---|---|---|
| 1 pivotal | 0% | 10% |
| 2 pivotal | 9% | 52% |
| 3 pivotal | 52% | 89% |

[17] The pivotal supplier results are provided for all offered regulation as additional information although these results are not directly relevant to the market structure analysis.

Based on these market structure results, the MMU concludes that the market structure of the PJM Mid-Atlantic Region Regulation Market during Phases 4 and 5-a can no longer be considered to be consistent with a competitive outcome. The combination of two market participants with market shares greater than, or equal to, 20 percent and the pivotal supplier results are not consistent with a competitive structure. The market in the PJM Mid-Atlantic Region was operated by PJM as a competitive market prior to the Combined Regulation Market.

### *Western Region Regulation Market – Phases 4 and 5-a*

During Phases 4 and 5-a, in the Western Region Regulation Market, the submitted offer capability was 2,267 MW. The level of resources offered on an hourly level and the level of regulation resources both offered and eligible to participate on an hourly level in the Regulation Market were lower than the submitted regulation offer capability. Between the beginning of Phase 4 and the end of Phase 5-a, the average hourly offer level was 938 MW or 41 percent of the submitted capability, while the average hourly eligible offer level was 847 MW or 37 percent of the submitted capability.

The ratio of the hourly regulation supply offered to the hourly regulation requirement, averaged 1.81 for the Phases 4 and 5-a Western Region Regulation Market. Based upon regulation offered and eligible, this ratio averaged 1.64. The average regulation requirement for the Phases 4 and 5-a Western Region Regulation Market was 517 MW.[18]

Hourly HHI values were calculated based upon the regulation offered, regulation offered and eligible and regulation assigned. Based upon regulation offered, HHI ranged from a maximum of 4357 to a minimum of 1748 with an average value of 2730. Fifty-eight percent of hours had an offered regulation HHI above 2500. Based upon regulation offered and eligible, HHI values ranged from a maximum of 4810 to a minimum HHI of 1757, with an average value of 2802. Fifty-eight percent of hours had an eligible regulation HHI above 2500. Based upon regulation assigned, HHI values ranged from a maximum of 7162 to a minimum HHI of 1698. The average HHI value for regulation assigned was 2973. Sixty-four percent of hours had an assigned regulation HHI above 2500. Table 0-6 summarizes the January through July 2005 Western Region Regulation Market HHIs.

[18] See Appendix F, "Ancillary Service Markets," for additional detail on the regulation requirements.

**Table 0-6 PJM Western Region Regulation Market hourly HHI: Phases 4 and 5-a <14_Graphs_Tables\HHI Tables.xls (Tab WRM HHIs) >**

| | Minimum | Average | Maximum | Percent Hours > 2500 |
|---|---|---|---|---|
| Offered | 1748 | 2730 | 4357 | 58% |
| Eligible | 1757 | 2802 | 4810 | 58% |
| Assigned | 1698 | 2973 | 7162 | 64% |

For the market segment excluding CTs, HHIs in the Western Region Regulation Market are somewhat higher. (See Table 7.)

**Table 7 PJM Western Region Regulation Market hourly HHI (All units except CTs): Phases 4 and 5-a< 14_Graphs_Tables\WRMHHIResultsxls.xls (Tab NO_CTs) >**

| | Minimum | Average | Maximum | Percent Hours > 2500 |
|---|---|---|---|---|
| Offered | 1859 | 2960 | 4973 | 60% |
| Eligible | 1856 | 3029 | 5249 | 62% |
| Assigned | 1738 | 2984 | 7162 | 65% |

During Phases 4 and 5-a, one supplier had a market share greater than, or equal to, 20 percent based on offered and eligible regulation. For the market segment excluding CTs, one supplier had a market share greater than, or equal to, 20 percent based on offered and eligible regulation.

During Phases 4 through 5-a, 62 percent of the hours failed the single pivotal supplier test for offered and eligible supply in the Western Region Regulation Market. This means that, during the seven-month period, the total regulation requirement could not be met for 62 percent of the hours in the absence of the largest supplier. One hundred percent of the hours failed the two pivotal supplier test. This means that, during 100 percent of the hours, the total regulation requirement could not be met in the absence of the two largest suppliers. One hundred percent of the hours failed the three pivotal supplier test. This means that, during 100 percent of the hours, the total regulation requirement could not be met in the absence of the three largest suppliers. Table 0-8 summarizes the Western Region Regulation Market pivotal supplier statistics for Phases 4 through 5-a.

**Table 0-8 PJM Western Region Regulation Market pivotal supplier statistics: Phases 4 and 5-a .<14_Graphs_Tables\RSI Tables.xls (Tab WRM PivSup)>**

| | Hours Offered (Percent) | Hours Eligible (Percent) |
|---|---|---|
| 1 pivotal | 30% | 62% |
| 2 pivotal | 100% | 100% |
| 3 pivotal | 100% | 100% |

Table 9 presents pivotal supplier statistics for the Western Region regulation pool for all units except CTs. Eighty-eight percent of hours fail the one pivotal supplier test. In both the all units and all units except CTs market segments the same company that was the one pivotal supplier was also pivotal for more than 95 percent of the hours in which two and three suppliers were pivotal.

**Table 9 PJM Western Region Regulation Market pivotal supplier statistics (All units except CTs:): Phases 4 and 5-a .<14_Graphs_Tables\WRMPivSupResultsxls.xls (Tab NonCTPivSupHours)>**

| | Hours Offered (Percent) | Hours Eligible (Percent) |
|---|---|---|
| 1 pivotal | 69% | 88% |
| 2 pivotal | 100% | 100% |
| 3 pivotal | 100% | 100% |

Based on these market structure results, the MMU concludes that the market structure of the Western Region Regulation Market was not consistent with a competitive outcome. The Regulation Market in the Western Region was operated by PJM, with the two dominant suppliers offer-capped, as a market with market-clearing prices during Phases 4 and 5-a.

### *PJM Combined Regulation Market – Phase 5-b*

The PJM Combined Regulation Market during Phase 5-b was comprised of the PJM Western Region (the ComEd, AEP, DAY, Dominion, DLCO and AP Control Zones) and the PJM Mid-Atlantic Region. For the Phase 5-b PJM Combined Regulation Market, the submitted capability was 5,491 MW. The average hourly offer level was 2,370 MW while the average hourly eligible offer level was 1,841 MW.

The ratio of the hourly regulation supply offered to the hourly regulation requirement averaged 2.42. Based upon regulation offered and eligible, this ratio averaged 1.88. The average regulation requirement for the Phase 5-b PJM Combined Regulation Market was 978 MW.

Hourly HHI values were calculated based upon the regulation offered, regulation offered and eligible and regulation assigned. Based upon regulation offered, HHI ranged from a maximum of 1331 to a minimum of 812 with an average value of 1001. Based upon regulation offered and eligible, HHI ranged from a maximum of 1562 to a minimum HHI of 866, with an average value of 1079. Based upon regulation assigned, HHI values ranged from a maximum of 2390 to a minimum of 878. The average HHI value for regulation assigned was 1299. Table 0-10 summarizes HHI results for the PJM Combined Regulation Market.

**Table 0-10 PJM Combined Regulation Market HHI: Phase 5-b <<14_Graphs_Tables\HHI Tables.xls (Tab RTO HHIs)>>**

| | Minimum | Average | Maximum | Percent Hours > 2500 |
|---|---|---|---|---|
| Offered | 812 | 1001 | 1331 | 0 |
| Eligible | 866 | 1079 | 1562 | 0 |
| Assigned | 878 | 1299 | 2390 | 0 |

For the market segment excluding CTs, HHIs are essentially the same. (See Table 11.)

**Table 11 PJM Combined Regulation Market HHI (All units except CTs): Phase 5-b< 14_Graphs_Tables\RTOHHIResultsxls.xls (Tab NO_CTs) >**

| | Minimum | Average | Maximum | Percent Hours > 2500 |
|---|---|---|---|---|
| Offered | 845 | 1016 | 1417 | 0 |
| Eligible | 891 | 1080 | 1659 | 0 |
| Assigned | 878 | 1301 | 2400 | 0 |

During Phase 5-b, in the PJM Combined Regulation Market, no suppliers had a market share greater than, or equal to, 20 percent for regulation offered and eligible. For the market segment excluding CTs, no suppliers had a market share greater than, or equal to, 20 percent for regulation offered and eligible. For the CT market segment, two suppliers had market shares in excess of 20 percent for regulation offered and eligible.

During Phase 5-b, 1 percent of the hours failed the single pivotal supplier test for offered and eligible supply in the PJM Combined Regulation Market. This means that, during the five-month period, the total regulation requirement could not be met for 1 percent of the hours in the absence of the largest supplier. Six percent of the hours failed the two pivotal supplier test. This means that, during 6 percent of the hours, the total regulation requirement could not be met in the absence of the two largest suppliers. Twenty-nine percent of the hours failed the three pivotal supplier test. This means that, during 29 percent of the hours, the total regulation requirement could not be met in the absence of the three largest suppliers. Table 0-12 summarizes the PJM Combined Regulation Market's pivotal supplier results for Phase 5-b. For all units including CTs the same company that was the one pivotal supplier for more than one-third of the one pivotal supplier intervals was also pivotal for more than 75 percent of the two pivotal supplier intervals and more than 80 percent of the hours in which two and three suppliers were pivotal. A second company was pivotal during more than 25 percent of the two pivotal and approximately 50 percent of three pivotal hours.

**Table 0-12 PJM Combined Regulation Market pivotal supplier statistics: Phase 5-b <<<14_Graphs_Tables\PivSup Tables.xls (Tab RTO PivSup)>>**

| | Hours Offered (Percent) | Hours Eligible (Percent) |
|---|---|---|
| 1 pivotal | 0% | 1% |
| 2 pivotal | 0% | 6% |
| 3 pivotal | 1% | 29% |

Table 13 presents pivotal supplier statistics for the PJM Combined Regulation Market's segment for all units except CTs.

**Table 13 PJM Combined Regulation Market pivotal supplier statistics (All units except CTs): Phase 5-b <<<14_Graphs_Tables\RTOPivSupResultsxls.xls (Tab NonCTPivSupHours)>>**

| | Hours Offered (Percent) | Hours Eligible (Percent) |
|---|---|---|
| 1 pivotal | 0% | 5% |
| 2 pivotal | 1% | 23% |
| 3 pivotal | 14% | 68% |

For the market segment excluding CTs, the percentage of one pivotal supplier hours in the eligible Regulation Market increases from 1 percent to 5 percent, the percentage of two pivotal supplier hours increases from 6 percent to 23 percent and the percentage of three pivotal supplier hours increases from 29 percent to 68 percent. (See Table 13.) In the all units except CTs market segment, the same company that was the one pivotal supplier for more than two-thirds of the one pivotal supplier intervals was also pivotal for more than 80 percent of the two pivotal supplier intervals and more than 95 percent of the hours in which two and three suppliers were pivotal. A second company is pivotal during more than 60 percent of the two pivotal and three pivotal hours, while the third pivotal position is shared by three companies with an approximately equal frequency of occurrence.

The MMU will make a recommendation to PJM members in the near future regarding the structural competitiveness of this market.

## Regulation Market Conduct

## Regulation Offers

Generators wishing to participate in any of the PJM Regulation Markets must submit regulation offers for specific units by hour 1800 EPT of the day before the operating day. The regulation offer price is subject to a $100 per MWh offer cap in PJM control zones with the exception of the dominant suppliers Dominion and AEP whose offers are capped at marginal cost plus $7.50 per MWh plus opportunity cost. In the PJM Western Region during Phase 4, all regulation offers were capped at $7.50 per MWh plus the cost of providing regulation service because that market was determined to be not structurally competitive. As in any competitive market, regulation offers at marginal cost are considered to be competitive. In PJM, a $7.50 per MWh adder is considered to be consistent with competitive offers based on an analysis of historical offer behavior.

The offer price is the only component of the regulation offer applicable for the entire operating day. The following information must be included in each offer, but can be entered or changed up to 60 minutes prior to the operating hour: regulating status (available, unavailable or self-scheduled); regulation capability; and high and low regulation limits. The Regulation Market is cleared on a real-time basis, and regulation prices are posted hourly throughout the operating day. The amount of self-scheduled regulation is confirmed 60 minutes before each operating hour, and regulation assignments are made 30 minutes before each operating hour.

PJM's Regulation Markets are cleared hourly, based upon both offers submitted by the units and the hourly opportunity cost of each unit.[19] The effective offer price is the sum of the unit-specific offer and the opportunity cost. In order to clear the market, PJM ranks units which offer and are eligible to regulate by effective offer price and selects the lowest offers in order until the amount of regulation required for the hour is satisfied at

[19] PJM estimates the opportunity cost for units providing regulation based on a forecast of locational marginal price (LMP) for the upcoming hour. Opportunity cost is included in the market-clearing price.

least cost. The price that results is the RMCP, and the unit that sets this price is the marginal unit.

## Regulation Market Performance

### Regulation Prices

Figure 0-2 shows both the daily average regulation market-clearing price and the opportunity cost component for the marginal units in the PJM Mid-Atlantic Region during Phases 4 and 5-a. Figure 0-3 shows the same data for the Western Region Regulation Market during Phases 4 and 5-a. Figure 0-4 shows the same data for the PJM Combined Regulation Market during Phase 5-b. All units chosen to provide regulation during Phases 4 and 5 received as payment the higher of the clearing price multiplied by the unit's assigned regulating capability, or the unit's regulation bid multiplied by its assigned regulating capability plus the individual unit's real-time opportunity cost.[20]

Regulation credits are awarded to generation owners that have either self-scheduled regulation or sold regulation into the market. Regulation credits for units self-scheduled to provide regulation are equal to the RMCP times the unit's self-scheduled regulating capability. Regulation credits for units that offered regulation into the market and were selected to provide regulation are the higher of the RMCP times the unit's assigned regulating capability, or the unit's regulation bid times its assigned regulating capability plus the opportunity cost that unit incurred. Although most units are paid RMCP times their assigned regulation MW, the RMCP is itself strongly dependent on the lost opportunity cost based upon forecast LMP calculated for the marginal unit during market clearing. This means that the total cost of regulation is very strongly dependent upon lost opportunity cost, which is dependent upon forecast LMP. Figure 0-2, Figure 0-3 and Figure 0-4 graph the RMCP against the estimated lost opportunity cost of the marginal unit (calculated at market clearance, adjusted for real-time deviations in LMP and averaged over the day). Most of the cost of regulation comes from the lost opportunity cost of the marginal unit. The rest of the RMCP is the unit's regulation offer. The average offer of the marginal unit for the PJM Mid-Atlantic Region during Phases 4 and 5-a was $15.33. The average offer of the marginal unit for the Western Region Regulation Market during Phases 4 and 5-a was $8.66. The average offer of the marginal unit for the PJM Combined Regulation Market during Phase 5-b was $13.16. In the PJM Mid-Atlantic Region Regulation Market during Phases 4 and 5-a, marginal unit lost opportunity cost (LOC) averaged 57 percent of the RMCP. In the Western Region Regulation Market during Phases 4 and 5-a, marginal unit LOC averaged 76 percent of

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20 See "PJM Operating Agreement, Accounting, m28," Revision 27, Section 4, "Regulation Credits" (October 1, 2004), pp. 26-27. PJM uses estimated opportunity cost to clear the market and real-time opportunity cost to compensate generators that provide regulation and spinning. Real-time opportunity cost is calculated using real-time LMP.

RMCP. In the PJM Combined Regulation Market during Phase 5-b, marginal unit LOC averaged 79 percent of RMCP.

**Figure 0-2 PJM Mid-Atlantic Region daily average regulation clearing price and adjusted estimated marginal unit opportunity cost: Phases 4 and 5-a << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Fig5_2_RMCP_LOC_graph_PJM_new.xls (tab: Graph)>>**

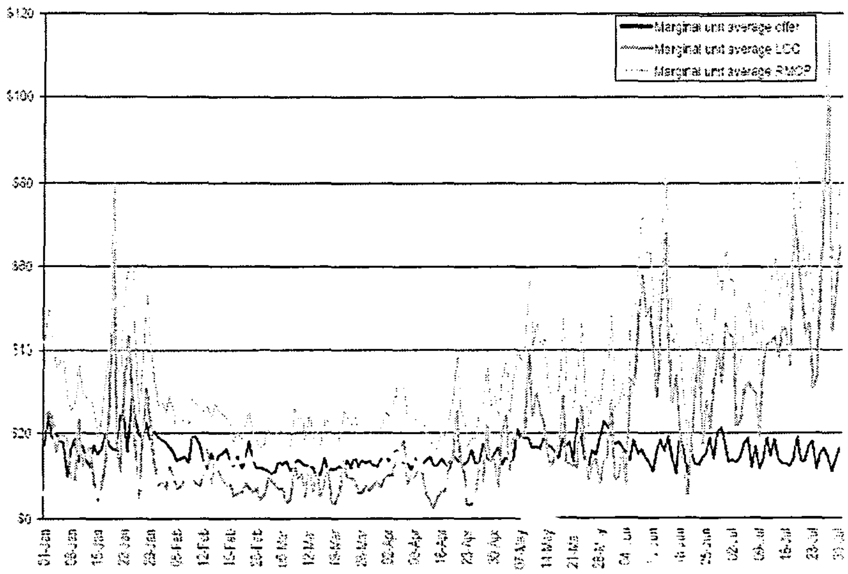


**Figure 0-3 PJM Western Region daily average regulation clearing price and adjusted estimated marginal unit opportunity cost: Phases 4 and 5-a << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Fig5_3_RMCP_LOC_graph_WRM_new.xls (tab: Graph)>>**

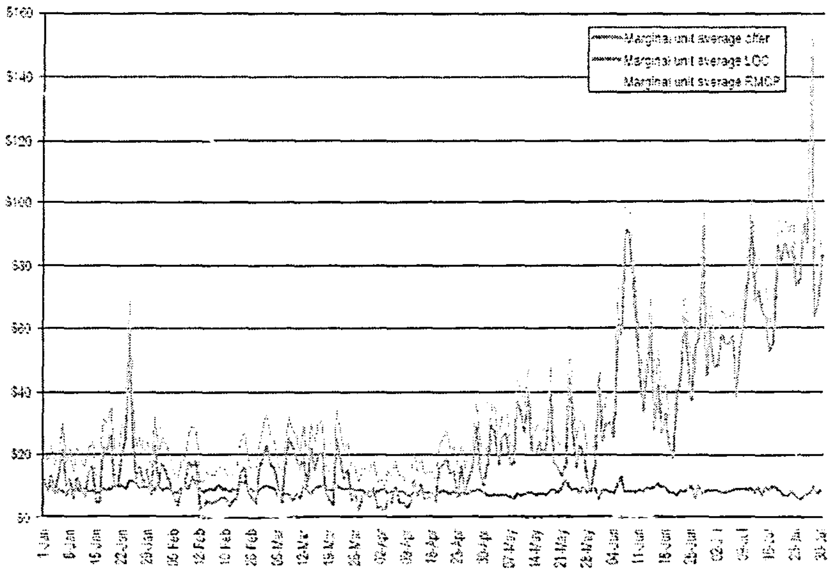


**Figure 0-4 PJM Combined Regulation Market daily average regulation clearing price and adjusted estimated marginal unit opportunity cost: Phase 5-b < H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Fig5_4_RMCP_LOC_graph_RTO_new.xls (tab: Graph)>**

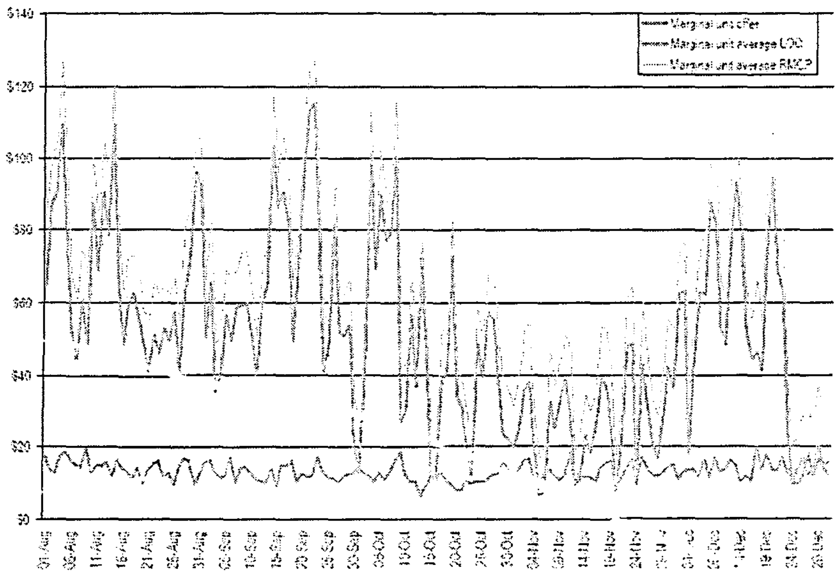



Figure 0-5, Figure 0-6 and Figure 0-7 compare the regulation price per MWh to the regulation MW purchased for each of the Regulation Markets. As the regulation requirement is a linear function of daily forecast peak load in all markets, all three graphs show that despite considerable daily variation, the price of regulation and the demand for regulation increase or decrease together on a seasonal scale. System LMP increases with load because higher priced units must be dispatched to meet demand and those increases in system LMP cause the opportunity cost to rise by increasing the spread between LMP and the energy offers of the regulating units.

**Figure 0-5 PJM Mid-Atlantic Region daily regulation MW purchased vs. price per MW: Phases 4 and 5-a <H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\RegMWPurch_vs_Price.xls (tab: PJMGraph)>>**

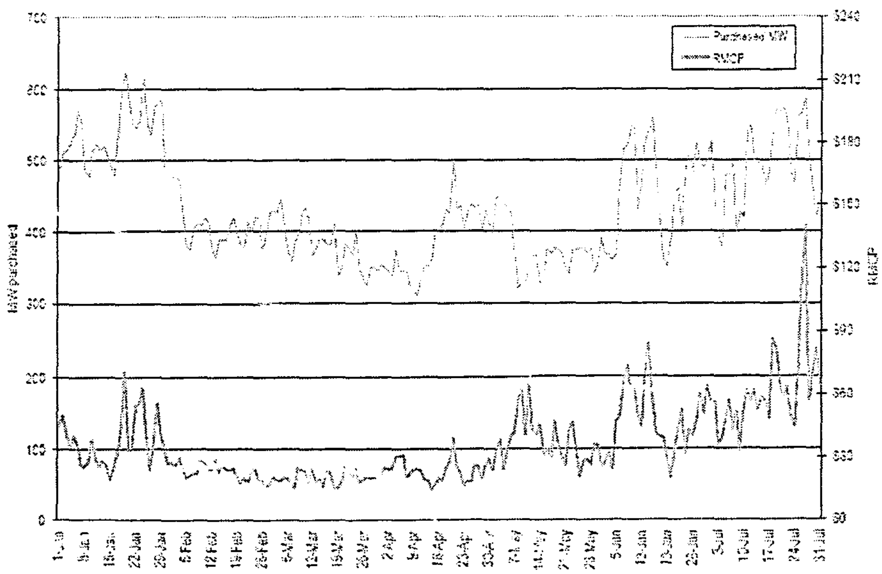


**Figure 0-6 PJM Western Region daily regulation MW purchased vs. price per MW: Phases 4 and 5-a <H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\RegMWPurch_vs_Price.xls (tab: WRMGraph)>>**

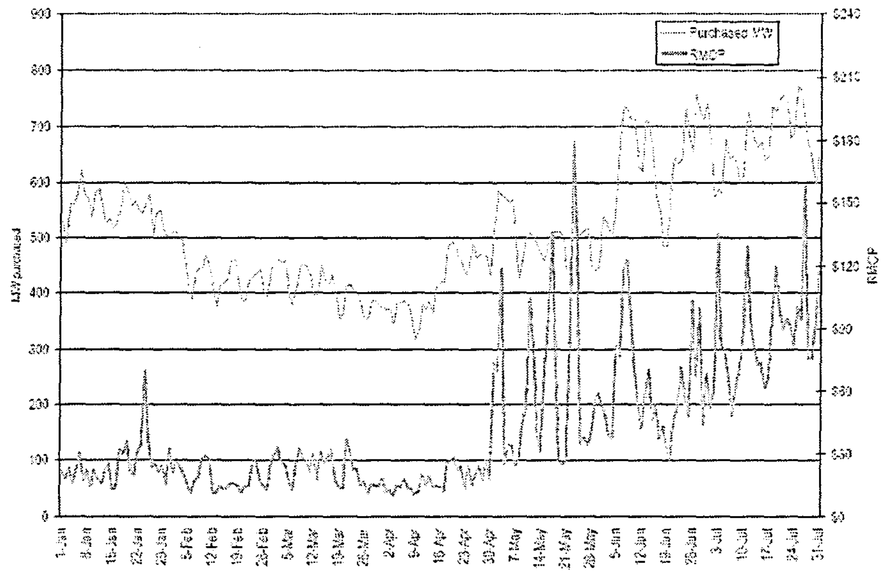
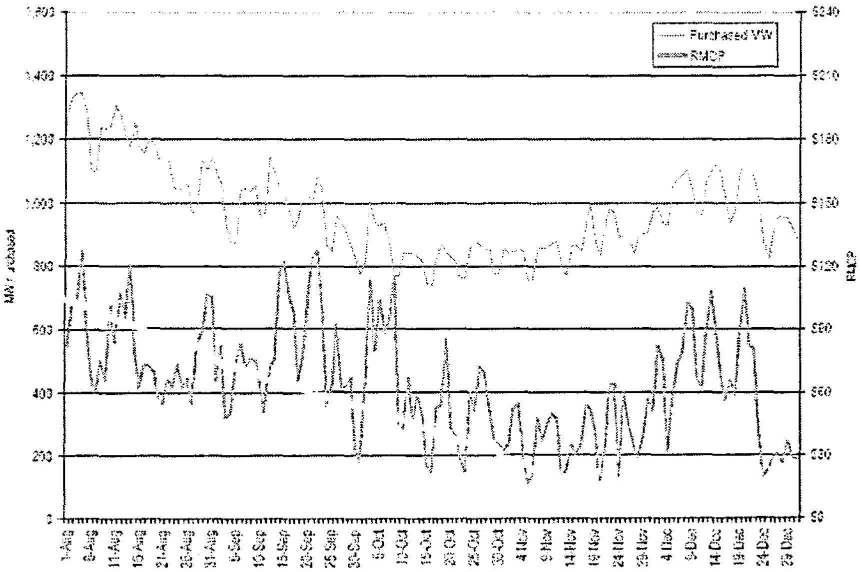


**Figure 0-7 PJM Combined Regulation Market daily regulation MW purchased vs. price per MW: Phase 5-b <H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\ RegMWPurch_vs_Price.xls (tab: RTOgraph)>>**



Important exceptions to this general pattern occurred periodically in the Western Region after the integration of Dominion on May 1, 2005. (See Figure 0-6.) An hourly analysis of regulation MW purchased versus the regulation price reveals some extreme exceptions that resulted from deficits during off-peak hours and/or times of minimum generation events. A shortage of regulation-capable units (as existed in the Western Region in early May) combined with a minimum generation event required expensive combustion turbine units to be started to satisfy regulation requirements resulting in high clearing prices. Minimum generation events can cause shortages of regulation in the PJM Mid-Atlantic Region as well, but since the regulation requirement in the PJM Mid-Atlantic Region is lower during off-peak hours it is less likely. Overall, the inflexibility of demand and the shortage of available regulating units caused relatively wide price swings in the Western Region during Phase 5-a.

As Figure 0-5, Figure 0-6 and Figure 0-7 also show, regulation prices during calendar year 2005 were seasonally higher in January, remained lower and relatively stable from February through April, then began to increase and show high daily variability into October before moderating at the end of the year. The higher average summer prices reflect higher LMPs in the LOC portion of the marginal unit's RMCP for regulation. (See Figure 0-2, Figure 0-3 and Figure 0-4.) During a period of low prices, March and April, the LOC/RMCP ratio was 42 percent for the PJM Mid-Atlantic Region and 58 percent for the Western Region. During a period of high prices, August and September, the LOC/RMCP ratio was 83 percent for the PJM Combined Regulation Market.

Figure 0-8 illustrates the level of demand for regulation by month in 2005 and the corresponding level of regulation cost.

**Figure 0-8 Monthly regulation MW and regulation cost per MW: Calendar year 2005 <J:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\CostPerMW_Monthly.xls (tab: graph)>**

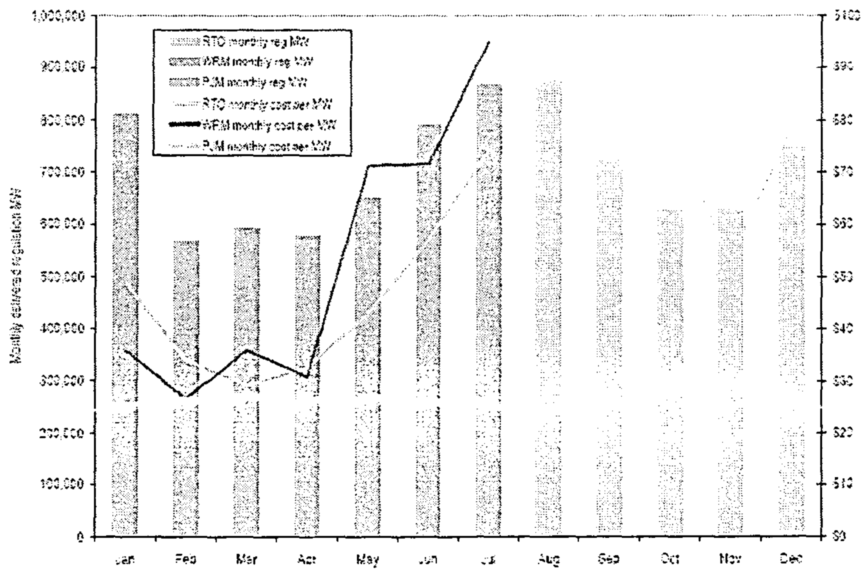
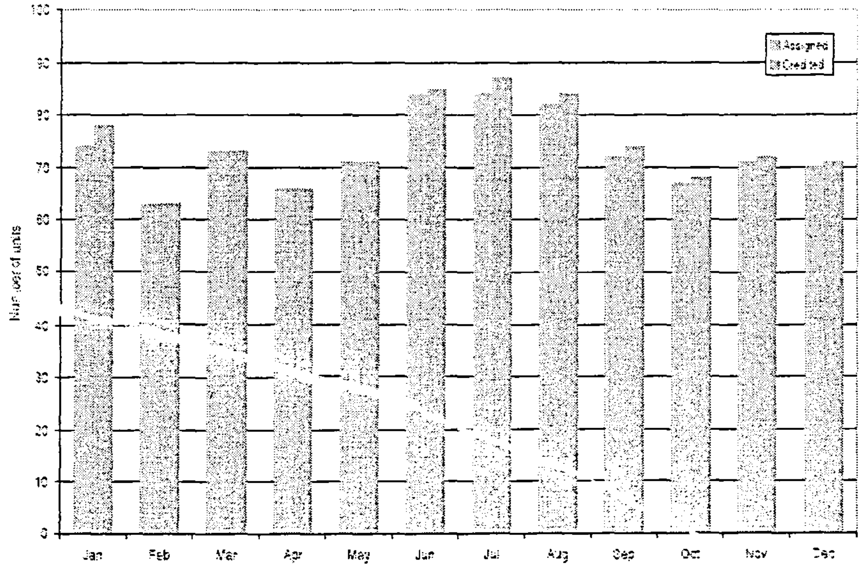



Figure 0-9 shows the average number of units per hour required to satisfy PJM's regulation requirement.

**Figure 0-9 Average hourly count of distinct units required to satisfy regulation requirement: Calendar year 2005 < J:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\UnitCount.xls (tab: UnitCountgraph)> >**



Units which provide regulation are paid the higher of the RMCP or their offer plus their unit-specific opportunity cost. In a perfect market all units would be compensated at RMCP times output. Sometimes, however, circumstances require that units be paid their offer plus their unit-specific opportunity cost. Examples include units that must be redispatched because of constraints, unanticipated performance problems, or changes in the real-time LMP and, therefore, opportunity cost from the value estimated at regulation market-clearing 30 minutes prior to the operating hour. For these reasons some units are paid the value of their offer plus their unit-specific lost opportunity costs when that sum is higher than the RMCP. This means that PJM's regulation cost per MWh is somewhat higher than the RMCP. Figure 0-10 and Figure 0-11 compare the regulation cost per MWh with the regulation clearing price to show the difference between the price of regulation and the total cost of regulation.

**Figure 0-10 PJM Western Region Regulation Market daily average RMCP vs. cost per MW for regulation: Phases 4 and 5-a <J:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\CostVsPrice.xls (tab: PJMWRMgraph)>**

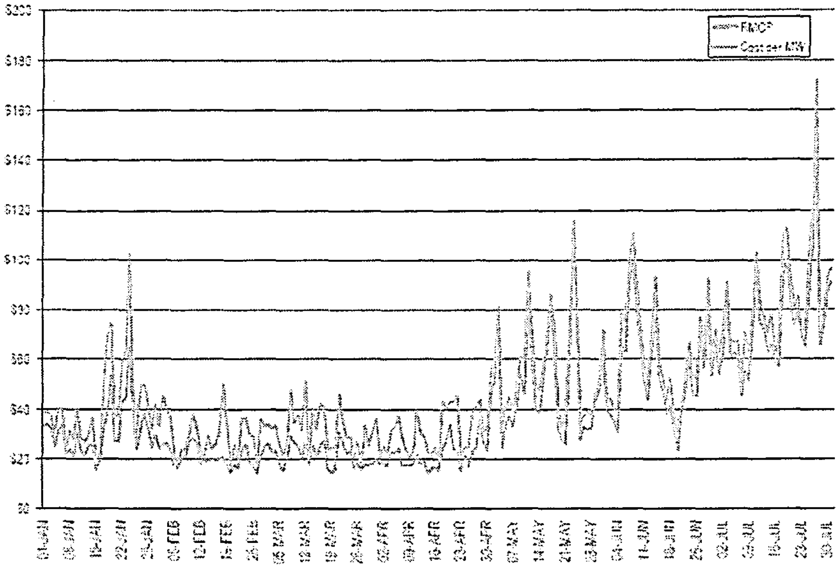
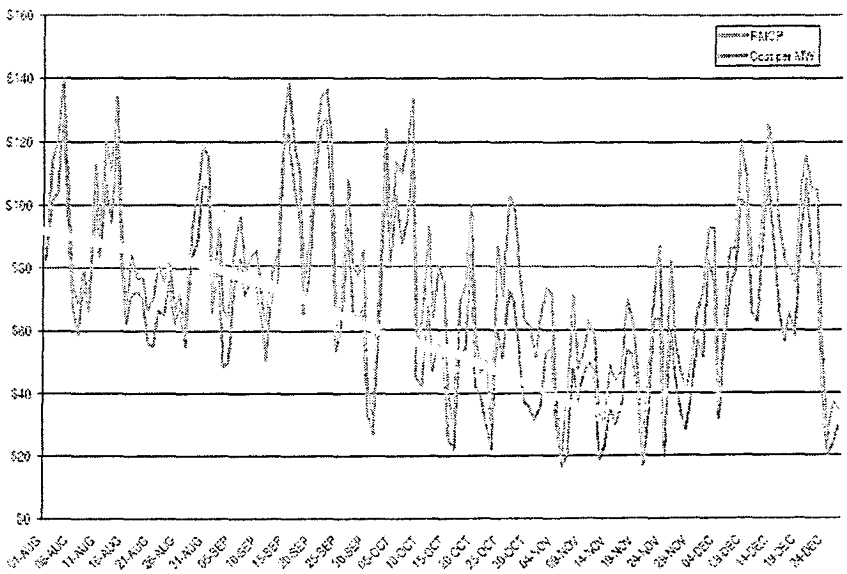


**Figure 0-11 PJM Combined Regulation Market daily average RMCP vs. cost per MW for regulation: Phase 5-b <J:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\CostVsPrice.xls (tab: RTOgraph)>**



## *Spinning Reserve Markets*

### Spinning Reserve Market Structure

The integration of Dominion on May 1, 2005, resulted in the creation of a Southern Region Spinning Reserve Market. Thus the PJM Spinning Reserve Markets include the PJM Mid-Atlantic Region Spinning Reserve Market, the Western Region Spinning Reserve Market, the ComEd Region Spinning Reserve Market and the Southern Region Spinning Reserve Market.

### Demand

Tier 2 spinning requirements are determined by subtracting the amount of forecast Tier 1 spinning reserve available from each spinning control area spinning reserve requirement for the period. The total spinning reserve requirement is different for each of the four regional Spinning Reserve Markets. For the Mid-Atlantic Region, the requirement is 75 percent of the largest contingency in the region, provided that 25 percent of the largest contingency is available as nonsynchronized, 10-minute reserve. For the ComEd Region, the requirement is 50 percent of the ComEd Control Zone's load ratio share of the largest contingency in the North American Electric Reliability Council's (NERC) Mid-America Interconnected Network, Inc. (MAIN) Region. From October 1 to December 3, 2004, this was 269 MW. After December 3, 2004, the ComEd

Control Zone's spinning requirement was 216 MW. For the Western Region, the requirement is 1.5 percent of the daily peak-load forecast. For the Southern Spinning Reserve Zone, the requirement is the Dominion Control Zone's load ratio share of the largest system contingency within the Virginia and Carolinas Area (VACAR), minus the available 15-minute quick start capability within the Southern Spinning Reserve Zone.

Computed in accordance with the requirements above, the average MW spinning requirement was: 1091 MW, for the PJM Mid-Atlantic Region; 217 MW for the ComEd Spinning Zone; 437 MW for the Western Region; and 5 MW for the Southern Spinning Reserve Zone (May to December only).

**Figure 0-12 PJM Mid-Atlantic Spinning Region average hourly required spinning vs. Tier 2 spinning purchased: Calendar year 2005 <<H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Spinning Required vs Tier 2 Purchased.xls (tab: PJM)>>**

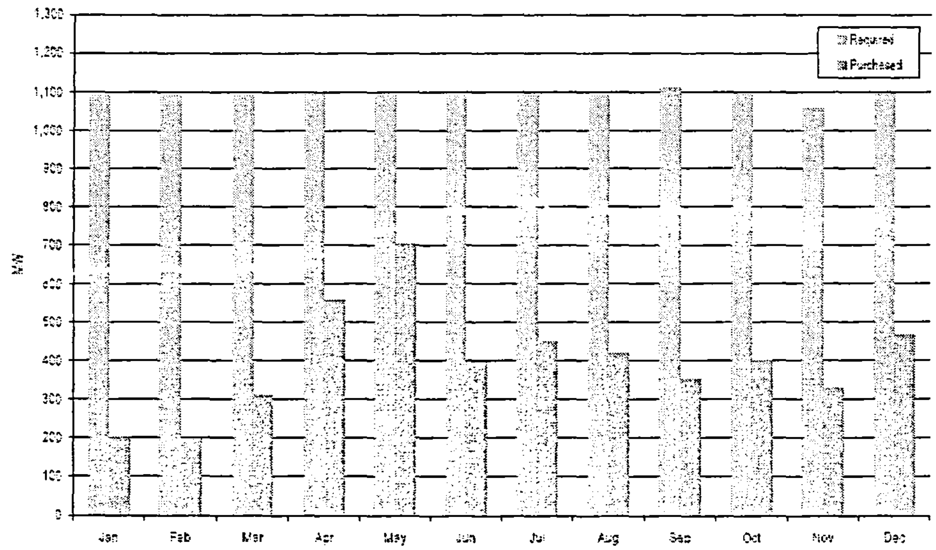




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**Figure 0-13 PJM ComEd Spinning Region average hourly required spinning vs. Tier 2 spinning purchased: Calendar year 2005 <H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Spinning Required vs Tier 2 Purchased.xls (tab: ComEd)>**

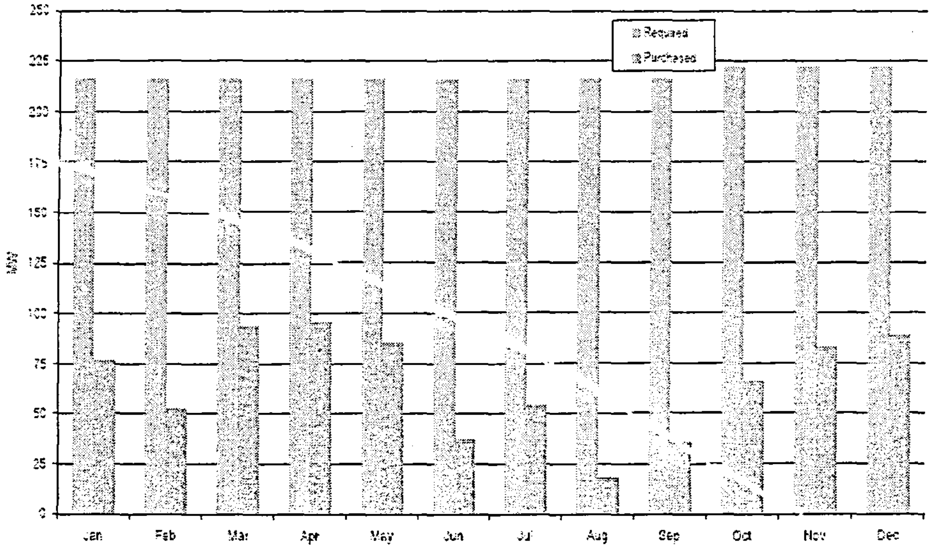
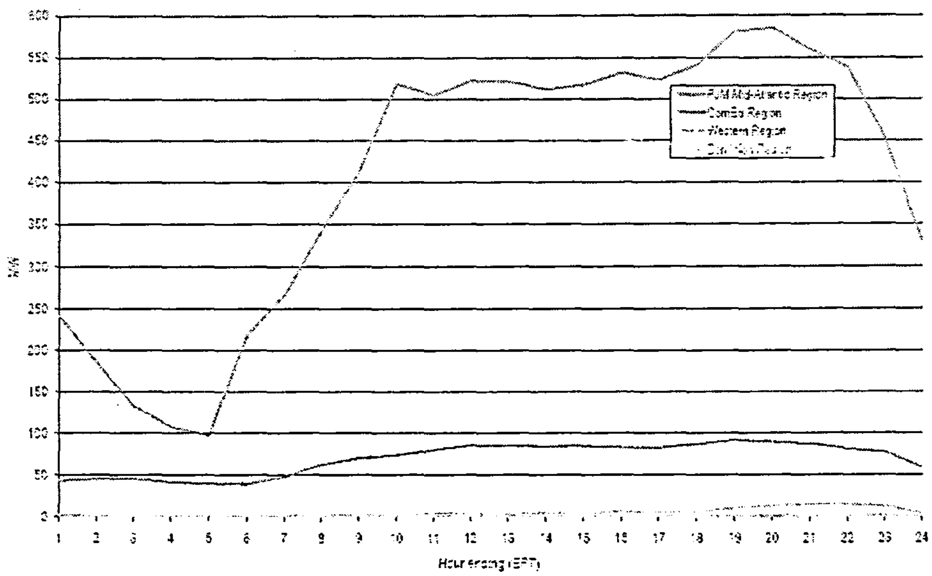



Figure 0-12 and Figure 0-13 show the average hourly spinning required and the average hourly Tier 2 spinning MW purchased during 2005 for the PJM Mid-Atlantic and ComEd Spinning Regions. Results for the Western Region Spinning Reserve Zone and the Southern Spinning Reserve Zone are not shown because Tier 2 spinning MW purchases were insignificant in those control areas during 2005. Spinning MW requirements are different for each of the four spinning regions in PJM. These differences are the result of specifications from local reliability councils, reserve-sharing arrangements with neighboring control areas and the types of generation available in the control area. The Southern Spinning Reserve Zone is a member of the VACAR subregion of NERC's Southeastern Electric Reliability Council (SERC). VACAR specifies that available 15-minute quick start reserve can be subtracted from the largest contingency to determine spinning reserve requirements. The amount of 15-minute quick start reserve available in VACAR is sufficient to make Tier 2 spinning requirements zero for most hours. Similarly, in the Western Region Spinning Reserve Zone most of the required spinning reserve is available as Tier 1 from large, frequently running baseload units, reducing its Tier 2 spinning requirement to zero in most hours. In both the PJM Mid-Atlantic and ComEd Spinning Regions the spinning reserve requirement is a function of the largest contingency. For the PJM Mid-Atlantic Region the hourly spinning requirement was usually 863 MW during off-peak hours and 1,150 MW during on-peak hours. Sometimes temporary grid conditions such as maintenance outages can cause double contingencies so there were times throughout the year when the on-peak spinning requirement was 1,380 MW. The average hourly Tier 2 spinning required for the PJM Mid-Atlantic Region was 1,091 MW. In the ComEd Region, the hourly requirement was 216 MW from January through September and 222 MW from October through December. Figure 0-12 and Figure 0-13 illustrate monthly average of the spinning reserve requirement and the amount of Tier 2 spinning actually purchased. The difference between the required spinning and Tier 2 spinning purchased is the amount of Tier 2 spinning available. Figure 0-14 illustrates the amount of Tier 2 spinning purchased by hour of the day. The hour variability reflects differing spinning reserve requirements for off-peak and on-peak hours as well as different amounts of Tier 1 spinning available.

**Figure 0-14 Average hourly Tier 2 spinning MW purchased (By hour of day): Calendar year 2005 <<H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Spinning Tier 2 Credited Average MWs By Hour.xls (tab: graph)>>**



## Supply

Spinning reserve is an ancillary service defined as generation that is synchronized to the system and capable of producing output within 10 minutes. Spinning reserve can, at present, be provided by a number of sources, including steam units with available ramp, condensing hydroelectric units, condensing CTs and CTs running at minimum generation.

All of the units that participate in the Spinning Reserve Market are categorized as either Tier 1 or Tier 2 spinning. Tier 1 resources are those units that are online following economic dispatch and able to respond to a spinning event by ramping up from their present output. All units operating on the PJM system are considered potential Tier 1 resources, except for those explicitly assigned to Tier 2 spinning. Tier 2 resources include units that are backed down to provide spinning capability and condensing units synchronized to the system and available to increase output.

PJM introduced a market for spinning reserve on December 1, 2002. Before the Spinning Reserve Market, Tier 1 spinning reserve had not been compensated directly and Tier 2 spinning reserve had been compensated on a unit-specific, cost-based formula.

Under the Spinning Reserve Market rules, Tier 1 resources are paid when they respond to an identified spinning event as an incentive to respond when needed. Tier 1 spinning payments or credits are equal to the integrated increase in MW output above economic dispatch from each generator over the length of a spinning event, multiplied by the spinning energy premium less the hourly integrated LMP. The spinning energy premium is defined as the average of the five-minute LMPs calculated during the spinning event plus $50 per MWh.[21] All units called on to supply Tier 1 or Tier 2 spinning have their actual MW monitored. Tier 1 units are not penalized if their output fails to match their expected response as they are only compensated for their actual response. Tier 2 units assigned spinning by market operations are compensated whether or not they are actually called on to supply spinning so they are penalized if their MW output fails to meet their assignment.

There were significant changes to the geographic structure of PJM's Spinning Reserve Markets in 2005. In Phase 4, PJM had three Spinning Reserve Markets: the PJM Mid-Atlantic Spinning Reserve Zone, the Western Spinning Reserve Zone and the ComEd Spinning Reserve Zone. During Phase 4, the Western Spinning Reserve Zone was comprised of AP, AEP, DAY and DLCO Control Zones. In Phase 5, the Dominion Control Zone was integrated into PJM and became the Southern Spinning Reserve Zone. Dominion remained a separate Spinning Reserve Market because as a member of SERC it has distinct spinning reserve requirements and reserve-sharing agreements.

Under the Spinning Reserve Market rules, Tier 2 spinning resources are paid to be available as spinning reserve, regardless of whether the units are called upon to generate in response to a spinning event and are subject to penalties if they do not provide spinning reserve when called. The price for Tier 2 spinning resources is determined in a market for Tier 2 spinning resources. Several steps are necessary before the hourly Tier 2 Spinning Reserve Market is cleared. Ninety minutes prior to the start of the hour, PJM estimates the amount of Tier 1 reserve available from every unit; 60 minutes prior to the

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21 See "PJM Manual 11: Scheduling Operations," Revision 23 (December 7, 2004), pp. 66-67.

start of the hour, self-scheduled Tier 2 units are identified. If spinning requirements are not met by Tier 1 and self-scheduled Tier 2 resources, then a Tier 2 clearing price is determined 30 minutes prior to the start of the hour. This Tier 2 price is equivalent to the merit-order price of the highest price, Tier 2 resource needed to fulfill spinning requirements, the marginal unit.[22]

The spinning offer price submitted for a unit can be no greater than the unit's operating and maintenance cost plus a $7.50 per MWh margin.[23, 24] The market-clearing price is comprised of the marginal unit's spinning offer price, the cost of energy use and the unit's opportunity cost. All units cleared in the Spinning Reserve Market are paid the higher of either the market-clearing price or the unit's spinning offer plus the unit-specific LOC and/or the cost of energy use incurred.

The Mid-Atlantic Region, the Western Region, the ComEd Region and the Southern Region Spinning Reserve Zones all operate under similar business rules. The Tier 2 Spinning Reserve Market in each of PJM's spinning reserve zones is cleared on cost-based offers because the structural conditions for competition do not exist. The structural issue can be more severe when the Spinning Reserve Market becomes local because of transmission constraints.

## Concentration of Ownership

The offered and eligible Tier 2 Spinning Reserve Markets for all four geographic markets are highly concentrated. (See Figure 0-15.) During calendar year 2005, in the Mid-Atlantic Region average HHI for offered Tier 2 spinning was 2167 and 2940 for eligible spinning. In the ComEd Region during 2005 the average HHI for offered spinning was 6305 and 8844 for eligible spinning. In the Western Region the average HHI for offered spinning was 4173 and 4593 for eligible spinning. In the Southern Region the HHI was 10000.

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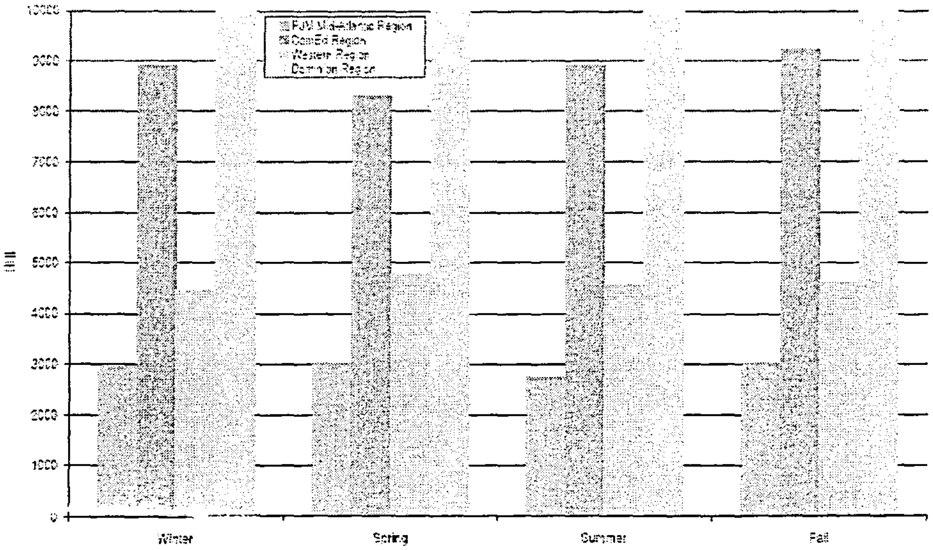
22 Although it is unusual, a PJM dispatcher can deselect units which have been committed after the clearing price is established. This only happens if real-time system conditions require dispatch of a spinning unit for constraint control, or problems with a generator or monitoring equipment are reported.

23 See "PJM Manual 11: Scheduling Operations," Revision 23 (December 7, 2004), p. 58.

24 See "PJM Manual 15: Cost Development Guidelines," Revision 4, (September 1, 2004), p. 31.

**Figure 0-15 Eligible Spinning Reserve Market HHI: Calendar year 2005 << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Spinning Tier2 Eligible HHIs FCS.xls (tab:graph)>>**




## Spinning Reserve Market Performance

## Spinning Reserve Offers

Figure 0-16 shows the daily average hourly offered Tier 2 spinning. Figure 0-17 shows the daily average hourly eligible Tier 2 spinning. Daily Tier 2 spinning offers are fairly stable reflecting the Tier 2 spinning capability of the units, other unit attributes and economic decisions by sellers. The level of eligible spinning displays considerable variability because it is calculated hourly and reflects current market and grid conditions, including LMP, unit dispatch and system constraints.

**Figure 0-16 Tier 2 spinning offered MW: Calendar year 2005 << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\Spinning Tier 2 Offered MWs and Offered $ per MWh Daily.xls (tab: Offered MW Graph>>**

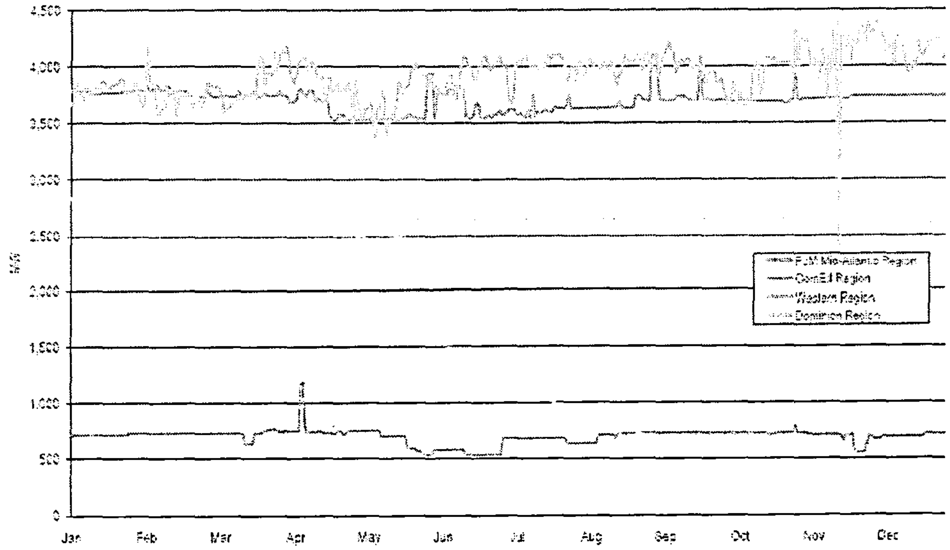


**Figure 0-17 Tier 2 spinning eligible MW: Calendar year 2005 << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\ Spinning Tier 2 Eligible MWs and Eligible $ per MWh Daily.xls>>**

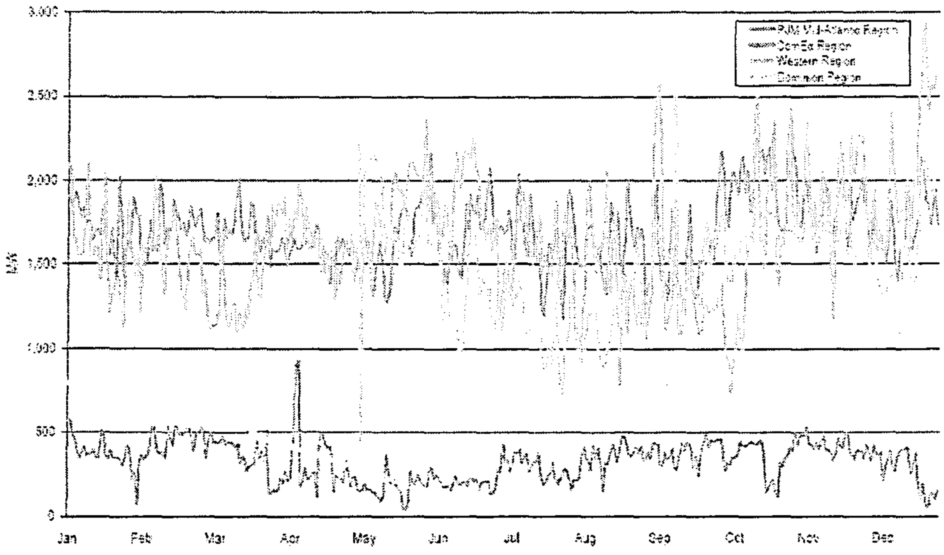
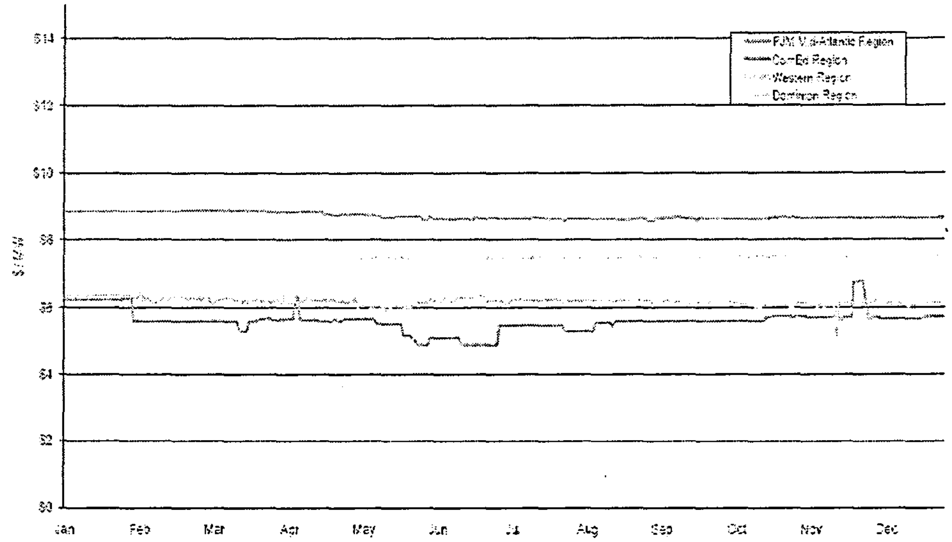



Figure 0-18 shows average offer price per MW by ancillary service area. Tier 2 spinning offers are capped at $7.50 plus costs. The clearing price for Tier 2 spinning includes lost opportunity costs based on LMP, energy use, and operating costs for units which are actually assigned Tier 2 spinning. (See Figure 0-19.)

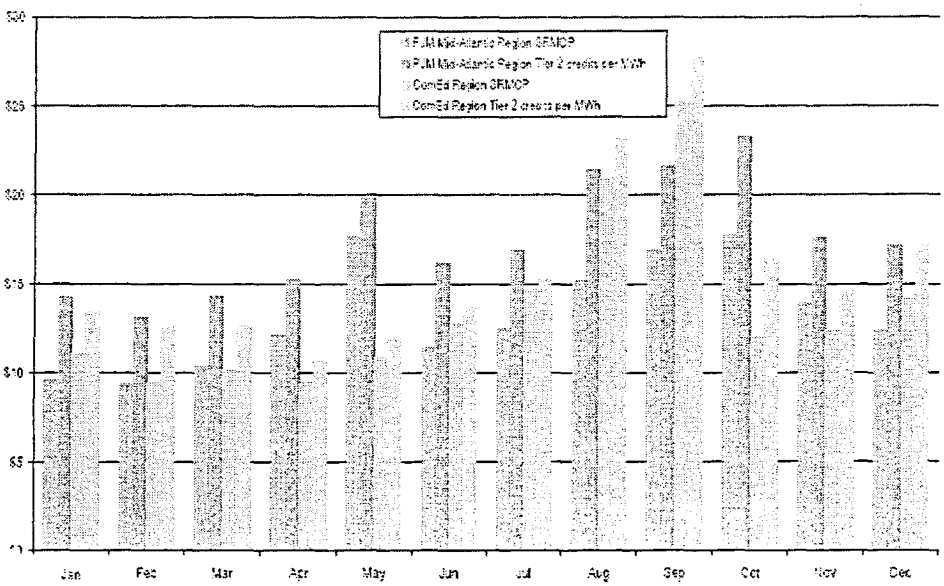
Figure 0-18 Tier 2 spinning average offer price per MW: Calendar year 2005 << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\ Spinning Tier 2 Offered MWs and Offered $ per MWh Daily.xls (tab: Offered $ per MW graph>>



## Spinning Reserve Prices

Figure 0-19 shows the average spinning reserve market-clearing price (SRMCP) and the cost per MW associated with meeting PJM demand for spinning reserve. The average PJM Mid-Atlantic Region SRMCP rose in 2005 to $13.29. The cost per MW of meeting the spinning reserve requirements also rose to approximately $17.59 per MWh. In the ComEd Region, the average SRMCP was $13.64 and the cost per MW for meeting the spinning reserve requirement was $15.85. No price data are presented for the Western Region Spinning Reserve Market because there was almost always adequate Tier 1 spinning reserve to meet the requirements for spinning reserve without clearing the Tier 2 market.

**Figure 0-19 Tier 2 spinning market-clearing price and cost per MW: Calendar year 2005 << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\ Spinning Tier 2 Credits Per MWh Daily Versus Average SRMCP.xls (tab: graph)>>**




The Western Region Spinning Reserve Market (not shown in Figure 0-19) during 2005 almost never had a clearing price because available Tier 1 spinning was always sufficient to cover the spinning requirement. For the 311 hours between June and December when a Spinning Reserve Market was cleared in the Western Region, the average clearing price was $12.27 and the cost of spinning was $66.75 per MWh. The Southern Region (not shown in Figure 0-19) was cleared only 18 hours between June 1 and December 31 with an average SRMCP of $11.34 and an average cost per MWh for Tier 2 spinning of $35.10.

Like Regulation Market prices, Tier 2 spinning reserve prices are more reflective of costs associated with the marginal unit than they are of offer prices. Unlike regulation, however, the costs in Tier 2 spinning are more than just opportunity costs; they are also energy costs for condensing MWh (which must be purchased from the Real-Time Energy Market when the unit is spinning), and startup costs if the assigned unit is not already running. Figure 0-20 and Figure 0-21 shows the relationship between the marginal unit's offer price and the SRMCP. For the PJM Mid-Atlantic Region during all of 2005 the Tier 2 spinning offer price averaged 67 percent of the SRMCP.

**Figure 0-20 PJM Mid-Atlantic Region Tier 2 spinning reserve clearing prices and marginal unit offer price: Calendar year 2005 << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\ SpinPriceLOC_final.xls (tab: PJMPriceLOCgraph)>>**

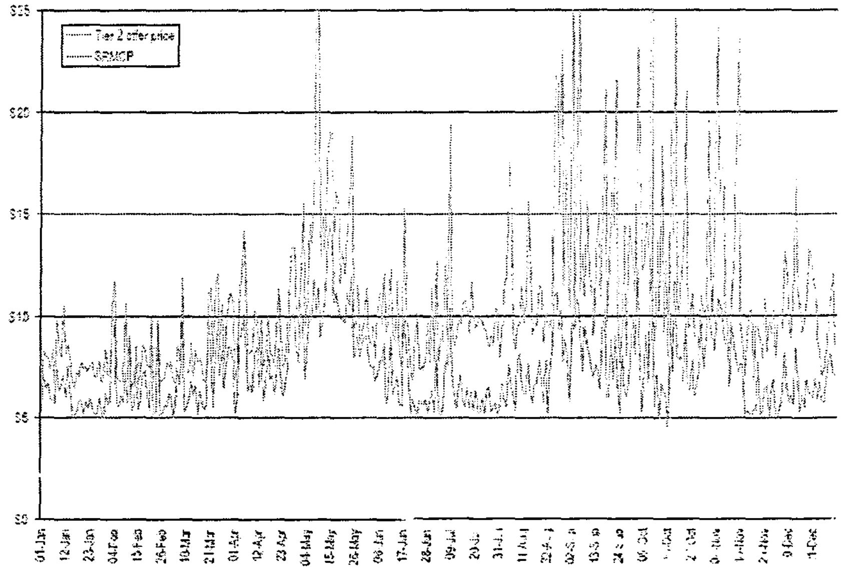



Figure 0-21 shows the relationship between the marginal units' offer price and the SRMCP for the ComEd Region. For the ComEd Region during all of 2005, the Tier 2 spinning offer price averaged 51 percent of the SRMCP.

**Figure 0-21 PJM ComEd Tier 2 spinning reserve clearing prices and marginal unit offer price: Calendar year 2005 << H:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\ SpinPriceLOC_final.xls (tab: ComEDPriceLOCgraph)>>**

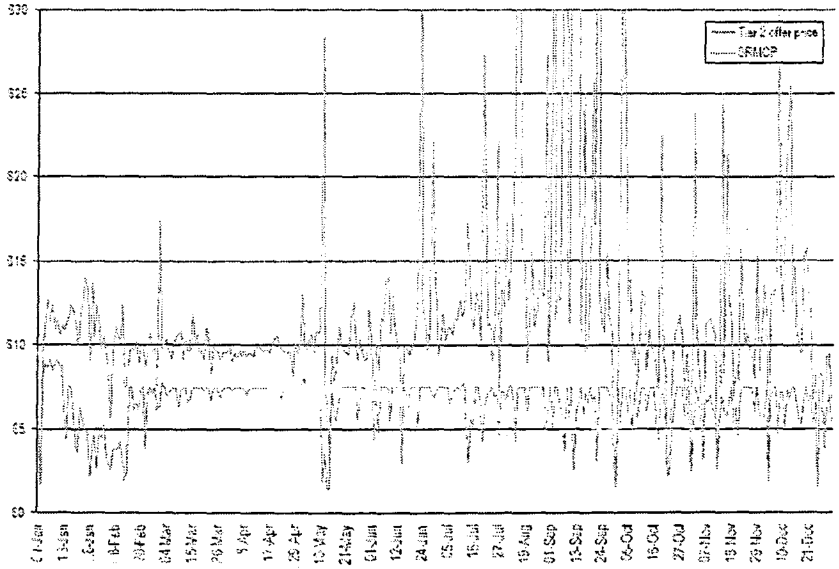
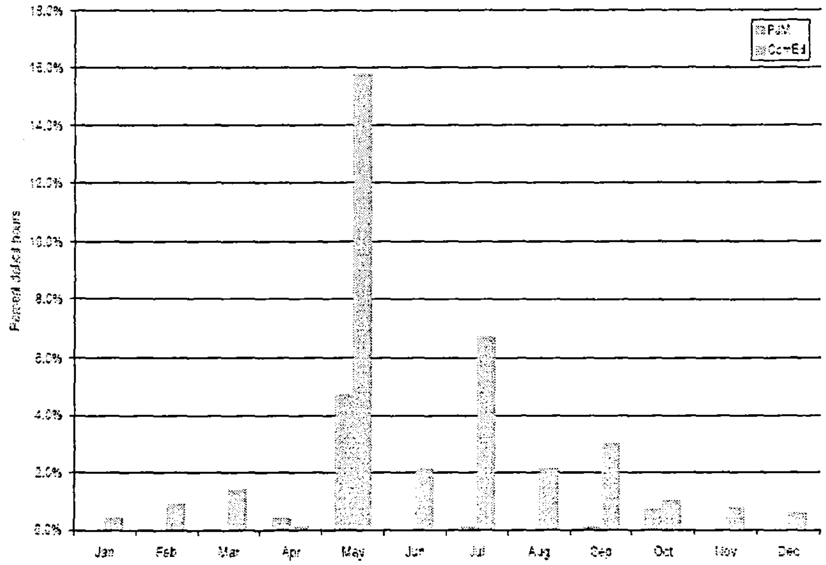



Figure 0-21 shows the level of Tier 1 and Tier 2 spinning reserve purchased from suppliers during calendar year 2005. Tier 1 resources are paid only if they respond during spinning events while Tier 2 resources are paid for providing hourly reserve. In general, more Tier 2 resources are purchased than Tier 1 resources, and Tier 2 payments are higher than Tier 1 payments. An important exception to this general rule was in the Western Region Spinning Reserve Market where a large baseload of available operating reserves ensures that Tier 1 spinning reserve services were almost always sufficient to cover the spinning requirement so Tier 2 spinning reserve was rarely purchased.

## Spinning Reserve Availability

A spinning reserve deficit occurs when the combination of Tier 1 and Tier 2 spinning is not adequate to meet the spinning reserve requirement. Except for a brief period in the ComEd Region during May (See Figure 0-22.), none of PJM's Spinning Reserve Markets had significant spinning reserve deficits during 2005.

**Figure 0-22 Tier 2 Spinning Reserve Market deficits: Calendar year 2005 <<J:\Office of the President\Market Monitoring Unit\SOM_2005\14_Graphs_Tables\DeficitResults.xls (tab: DeficitResultsGraph)>>**




The Tier 2 spinning deficit peak during May in the ComEd Region was caused indirectly by a need for regulation and the assignment of several CTs, which otherwise provided spinning reserve to regulation. None of these Tier 2 spinning deficits created a serious problem because the ComEd Region's reserve requirement was satisfied by a reserve-sharing agreement with other members of MAIN.

Wright & Talisman, P.C.

# Memorandum

To: Richard A. Drom

From: Barry S. Spector

Date: February 20, 2002

Re: Potential Expansion of PJM Board and Reformation of Market Monitoring Structure

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## I. Introduction

You have asked us to provide PJM Interconnection, L.L.C. ("PJM") legal guidance regarding PJM's consideration of an expansion of the PJM board in connection with a reformation of the structural arrangements for PJM market monitoring. The board expansion would enable the formation of a new committee of the board to oversee the PJM market monitoring unit. The members of this market monitoring committee would be precluded from sitting on any other board committees. In this manner, oversight of the market monitoring function would be largely independent of other board functions, although the full board would continue its overall responsibility to supervise and oversee all PJM matters.

## II. Size of the Board

### A. Legal Requirements

Under Delaware law, a limited liability company that is managed by a board of managers may have any number of board members, as provided in the LLC operating agreement. Delaware Limited Liability Company Act § 18-402.

Currently, the PJM Operating Agreement [1] provides that there will be an eight member board of managers, consisting of seven voting members, serving staggered terms, who are elected by the PJM members, and the president, appointed by the board, who is a non-voting member of the board. Operating Agreement § 7.1. An independent consultant prepares a list of qualified candidates from which PJM selects a slate to be presented to the PJM members at the annual meeting of members. If the members do not fill all seats from the slate, then the independent consultant is directed to propose additional candidates. Id.

Consistent with Delaware law, nothing in the PJM Operating Agreement prevents an amendment to the agreement to specify a different number of board members (or different

[1] Amended and Restated Operating Agreement of PJM Interconnection, L.L.C.

election procedures, if desired). An amendment to the Operating Agreement may be made upon (i) submission of the amendment to the board for review and comment; (ii) approval of the amendment by the members committee (by a two-thirds sector vote); and (iii) approval by the FERC. Operating Agreement § 18.6. If the board recommends an amendment, but the members do not adopt it, then the board may seek to place the amendment into effect through a complaint under section 206 of the Federal Power Act. Operating Agreement § 7.7(vi). In that event, the board would have to demonstrate to FERC that the existing size of the board is unjust and unreasonable, and that the proposed new arrangements are just and reasonable. Federal Power Act § 206(a).

In short, there are no insurmountable legal impediments to changing the size of the board, if PJM follows the above procedures for amending the Operating Agreement and the FERC approves the amendment.

**B. FERC Precedent**

The FERC has approved ISO and RTO boards of varying sizes, without specifically commenting on the number of board members under the various governance arrangements. The Commission's focus has been on the selection process and ensuring the board's independence, not its size.

The FERC has approved boards of the following sizes:

(1) New York ISO

Ten voting directors, one of whom is the executive director selected by the other nine. The initial nine directors were chosen by a stakeholder selection committee following recommendations of an independent search firm; thereafter, the board is self-perpetuating.

(2) ISO New England

Ten voting directors, one of whom is the CEO selected by the other nine. The initial nine directors were chosen by a NEPOOL stakeholder committee; thereafter, the board is self-perpetuating.

(3) Midwest ISO

Eight voting directors. Seven directors are selected by the stakeholders from a slate produced by an independent search firm, and an eighth director is the Midwest ISO president selected by the other seven directors. The president's vote is not counted if it creates a tie vote.

(4) GridFlorida

Nine voting directors. Eight directors are selected by "non-market participant" stakeholders using an independent search firm to identify candidates. The eight directors select a CEO who is the ninth member of the board. Under GridFlorida's articles of incorporation, the board may increase its size up to a total of 12 members.

(5) GridSouth

Seven voting directors. Six initial directors are elected by the stakeholders, and the seventh is the CEO selected by the other six directors; thereafter, the board is self-perpetuating.

(6) RTO West

Nine voting directors, selected by stakeholders from slates identified by an independent search firm.

Thus, FERC has approved boards of between seven and ten members, and at least one set of articles of incorporation allows the board to increase the board size to twelve. An expansion of the PJM board by two or three additional members would produce a board with a size consistent with these previously approved boards.

## III. Recent Market Monitoring Developments

The FERC has approved various forms of market monitoring units. In some instances, as in PJM, FERC has approved placing the market monitoring function entirely within the ISO/RTO. See Carolina Power & Light Co., 94 FERC ¶ 61,273 (2001) (GridSouth); PJM Interconnection, L.L.C., 86 FERC ¶ 61,247 (1999). In other instances, the FERC has approved internal market monitoring units that are advised by outside consultants. See Central Hudson Gas & Electric. Corp., 86 FERC ¶ 61,062 (1999) (New York ISO; market monitoring functions shared by outside advisor and internal ISO staff); New England Power Pool, 85 FERC ¶ 61,379 (1998) (ISO New England; independent entity works with ISO internal staff); Pacific Gas & Electric Co., 81 FERC ¶ 61,122 (1997) (California ISO; internal compliance division works with committee of independent experts that reviews its decisions). In still other instances, the FERC has approved market monitoring units that are entirely separate from the ISO/RTO. See Midwest ISO, 97 FERC ¶ 61,326 (2001) (independent company acts as monitor); GridFlorida, LLC, 94 FERC ¶ 31,363 (2001) (separate non-profit corporation established for market monitoring).

Most recently, the Commission and market participants have sought to ensure greater autonomy for market monitoring units. In acting on PJM's RTO filing, for example, the Commission continued to recognize that market monitors are not required to be "outside" of the RTO, but it stated that the Commission "will expect to receive the reports and analyses of an RTO's market monitor at the same time they are submitted to the RTO." PJM Interconnection, L.L.C., 96 FERC ¶ 61,061 at 61,239 (2001) (citing California Independent System Operator Corp., 86 FERC ¶ 61,059 (1999)).

In the same vein, many participants in the Northeast RTO mediation process advocated greater separation of the market monitor from the remaining functions of the ISO/RTO. Although initially advocating complete separation of the market monitor from the ISO/RTO, following mediation discussions with PJM these parties supported a market monitoring function "conducted under the supervision of a dedicated subcommittee of the RTO Board."[2]

These parties submitted to the Commission a proposed charter for a "Monitoring Committee" of the Northeast RTO board of managers.[3] The charter provides for a separate 3-member board committee to supervise and oversee all matters pertaining to the RTO's market monitoring unit. The committee members could not serve on any other committee. Among other things, the committee would hire the market monitor, and it would have exclusive responsibility for approving the market monitoring unit's budget, which the president would include in the RTO budget without modification. The committee would review all market monitoring reports published outside the RTO (prior to issuance if consistent with FERC requirements).

Along the same lines, at the Members Committee meeting of February 14, 2002, Reliant Energy's representative presented a proposal for restructuring of the market monitoring function in PJM. That presentation proposed four enhancements to PJM market monitoring: (1) specification that the monitoring unit would monitor buyers, sellers, transmission entities (such as ITCs), and the ISO/RTO; (2) provision for an external audit; (3) addition of two new board members and the establishment of a separate board committee for market monitoring oversight; and (4) elimination of any implicit reporting by the market monitor directly to PJM staff.

Each of the above developments indicates a growing unease by regulators and market participants about current market monitoring structures. In different ways, each development reflects a mounting desire to have market monitoring captured as a more independent function within an ISO/RTO. In light of the developments, it would be reasonable for PJM to consider amendments to the current market monitoring structure.

## IV. Qualifications of Additional Board Members

The PJM Operating Agreement specifies the qualifications for board members. Among other things, the Operating Agreement ensures that there is adequate diversity of experience on the board. It accomplishes this goal by specifying that: four of the elected board members shall have expertise and experience in the areas of corporate leadership at the senior management or board of directors level, or in the professional disciplines of finance or accounting, engineering, or utility law and regulation. Of the remaining three elected board members, one shall have expertise and experience in the operation or concerns of transmission dependent utilities, one shall have expertise and experience in the operation and planning of

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[2] Comments on Northeast RTO Mediation Report of Aquila Energy Marketing Corporation, et al., Docket No. RT01-99-000 (Oct. 9, 2001) at 4.
[3] The draft charter was negotiated among PJM and these parties.

transmission systems, and one shall have expertise and experience in the area of commercial markets and trading and associated risk management. Operating Agreement § 7.2.

The mediation proposal regarding market monitoring suggested that the qualifications for the market monitoring committee of the board should be expertise and experience collectively in the following areas: economics or finance; commodities marketing or trading with emphasis on electricity or gas; electric market design; and antitrust law or economics. Proposed Charter (Membership). While certain of these expertises overlap existing qualifications specifications in the Operating Agreement, PJM may want to consider adding explicit qualifications for any market monitoring committee that is established.

In adding members to the board, PJM also may want to consider recent FERC expressions of interest in having more "public spirited" RTOs. The Commissioners (as well as market participants) recently have been advocating the need for RTO's to have more of a public interest focus, as opposed to a profit driven focus. The Chairman of the Commission has expressed concern that "objectivity" regarding the public interest can be "lost somehow in a profit-driven entity." FERC Meeting, Oct. 24, 2001, transcript at 113 (remarks of Chairman Wood). Some issues, the Chairman has said, should be addressed by a more public-oriented process rather than a "for-profit shareholder board." Id. at 119. Thus, it might be prudent for PJM to seek additional candidates for any expanded board seats who have more of a "non-profit" orientation towards regulation, markets, and antitrust economics and law.

Market monitoring – board expansion memo

# ATTACHMENT M

# PJM MARKET MONITORING PLAN

## I. OBJECTIVES

The objectives of this Market Monitoring Plan are to: (1) monitor and report on issues relating to the operation of the PJM Market, including the determination of transmission congestion costs or the potential of any Market Participant(s) to exercise market power within the PJM Region; (2) evaluate the operation of both pool and bilateral markets to detect either design flaws in the PJM Market operating rules, standards, procedures, or practices as set forth in the PJM Tariff, the PJM Operating Agreement, the PJM Reliability Assurance Agreement, The Reliability Assurance Agreement-South, the Reliability Assurance Agreement-West, the PJM Manuals, or PJM Regional Practices Document or to detect structural problems in the PJM Market that may need to be addressed in future filings; (3) evaluate any proposed enforcement mechanisms that are necessary to assure compliance with pool rules; and (4) ensure that the monitoring program will be conducted in an independent and objective manner. The Plan also prescribes reporting procedures that PJM will use to inform governmental agencies and others concerning its market monitoring activities.

Consistent with the PJM Operating Agreement, PJM will carry out these objectives in a manner consistent with the safe and reliable operation of the PJM Region, the creation and operation of a robust, competitive, and non-discriminatory electric power market in the PJM Region, and the principle that a Member or group of Members shall not have undue influence over the operation of the PJM Market.

This Plan applies to PJM, Market Participants, and all entities that take service under the PJM Tariff.

## II. DEFINITIONS

Unless the context otherwise requires, for purposes of this Plan, capitalized terms shall have the meanings given below or in Section I of the PJM Tariff.

(a) "**Authorized Government Agency**" means a regulatory body or government agency, with jurisdiction over PJM, the PJM Market, or any entity doing business in the PJM Market, including, but not limited to, the Commission, state utility commissions, and state and federal attorneys general.

(b) "**Corrective Action**" means an action set forth in section IV of this Plan.

(c) "FERC Market Rules" means the market behavior rules and the prohibition against electric energy market manipulation codified by the Commission in its Rules and Regulations at 18 CFR §§ 1c.2 and 35.37, respectively; the Commission-approved PJM Market Rules and any related proscriptions or any successor rules that the Commission from time to time may issue, approve or otherwise establish.

(d) "**Market Monitoring Unit**" means the organization within PJM that is responsible for implementing this Plan.

(e) "**Market Participant**" means an entity that generates, transmits, distributes, purchases, or sells electricity or provides ancillary services with respect to such services (or contracts to perform any of the foregoing activities) within, into, out of, or through the PJM Region.

(f) **"PJM"** means PJM Interconnection, L.L.C., including the Office of the Interconnection as referenced in the PJM Operating Agreement.

(g) **"PJM Board"** means the Board of Managers of PJM or its designated representative.

(h) **"PJM Entities"** means PJM, including the Market Monitoring Unit, the PJM Board, and PJM's officers, employees, representatives, advisors, contractors, and consultants.

(i) **"PJM Manuals"** means those documents produced by PJM that describe detailed PJM operating and accounting procedures that are made publicly available in hard copy and on the Internet.

(j) **"PJM Market"** means the PJM Interchange Energy Market together with all bilateral or other electric power and energy transactions, ancillary services transactions, and transmission transactions within the PJM Region.

(k) "PJM Market Rules" mean the rules, standards, procedures, and practices of the PJM Market set forth in the PJM Tariff, the PJM Operating Agreement, the PJM Reliability Assurance Agreements, the PJM Consolidated Transmission Owners Agreement, the PJM Manuals, the PJM Regional Practices Document and the PJM-Midwest Independent Transmission System Operator.

(l) "PJM Operating Agreement" means the Amended and Restated Operating Agreement of PJM on file with the Commission.

(m) **"PJM Regional Practices Document"** means the document of that title that compiles and describes the practices in the PJM Market and that is made available in hard copy and on the Internet.

(n) **"PJM Reliability Assurance Agreements"** means the Reliability Assurance Agreement among Load Serving Entities in the PJM Control Area, the PJM South Reliability Assurance Agreement among Load Serving Entities in the PJM South Region, and the PJM West Reliability Assurance Agreement among Load Serving Entities in the PJM West Region, each on file with the Commission.

(o) **"PJM Tariff"** means the Open Access Transmission Tariff of PJM on file with the Commission.

(p) "PJM Transmission Owners Agreement" means the PJM Consolidated Transmission Owners Agreement on file with the Commission.

(q) **"Plan"** means the PJM market monitoring plan set forth in this Attachment M.

(r) **"President"** means the President and Chief Executive Officer of PJM.

## III. MONITORED ACTIVITIES

The Market Monitoring Unit shall be responsible for monitoring the following:

**A.** Compliance with the PJM Market Rules.

**B.** Actual or potential design flaws in the PJM Market Rules.

**C.** Structural problems in the PJM Market that may inhibit a robust and competitive market.

**D.** The potential for a Market Participant to exercise market power or violate any of the FERC Market Rules.

## IV. CORRECTIVE ACTIONS

**A. Required Notice to Commission:** Immediately upon determining that it has identified a significant market problem or a potential violation by a Market Participant of the PJM Market Rules or any of the FERC Market Rules that may require (a) a change in the PJM Market Rules, (b) further inquiry by the Market Monitoring Unit, (c) referral for investigation by the Commission and/or (d) action by the Commission or one or more state commissions, the Market Monitoring Unit shall notify the Commission's Office of Enforcement (or any successor), either orally or in writing. Nothing in this Section IV.A shall limit the ability of the Market Monitoring Unit to engage in discussions with any such Market Participant as provided in Section IV.C.1.

**B. Required Referral to Commission:** In addition to the notification provided in section IV.A. above, where the Market Monitoring Unit has reason to believe, based on sufficient credible information, that a Market Participant has either violated (a) a PJM Market Rule, or (b) any of the FERC Market Rules, the Market Monitoring Unit will refer the matter to the Commission's Division of Investigations (or any successor) in the manner described below. The foregoing notwithstanding, a clear, objectively identifiable violation of a PJM Market Rule, where such rule provides for an explicit remedy that has been accepted by the Commission and can be administered by PJM, shall not be subject to the provisions of this section IV.B.

Such a referral to the Commission shall be in writing, shall be non-public and should include, but need not be limited to, the following information:

1. The name(s) of and, if possible, the contact information for, the market participants that allegedly took the action(s) that constitute that alleged Market Violation(s);

2. The date(s) or time period during which the alleged Market Violation(s) occurred and whether the alleged wrongful conduct is ongoing;

3. The specific FERC Market Rule(s) and/or tariff provision(s) that were allegedly violated;

4. The specific act(s) or conduct that allegedly violated the FERC Market Rules or tariff;

5. The consequences in the market resulting from the act(s) or conduct, including, if known, an estimate of economic impact on the market;

6. If the Market Monitoring Unit believes that the act(s) or conduct constituted manipulative behavior in violation of the FERC Market Rules, a description of the alleged manipulative effect on market prices, market conditions, or market rules; and

7. Any other information that the Market Monitoring Unit believes is relevant and may be helpful to the Commission.

Following the submission of such a referral, the Market Monitoring Unit will continue to inform the Commission's staff of any information relating to the referral that it discovers within the scope of its regular monitoring function, but it shall not undertake any investigative steps regarding the referral except at the express direction of the Commission's staff.

C. **<u>Additional Market Monitoring Unit Authority</u>:** In addition to notifications and referrals under Sections IV.A and IV.B, respectively, the Market Monitoring Unit may take the following additional actions, to the extent it deems necessary, as a result of its monitoring activities:

1. Engage in discussions with Market Participants regarding issues relating to their possible violations of the FERC Market Rules, in order to understand such issues and to attempt to resolve informally such issues or other issues with Market Participants.

2. Recommend to the appropriate entity (including, if and as appropriate, PJM committees, the PJM Board, or the Commission) modifications to the PJM Market Rules. This recommendation may be made in the form of a written or oral report to the appropriate entity.

3. With the approval of the PJM Board, file reports or complaints with Authorized Government Agencies or make other appropriate regulatory filings to address design flaws, structural problems, compliance, market power, or other issues, and seek such appropriate action or make such recommendations as the Market Monitoring Unit shall deem appropriate.

4. If PJM does not follow the Market Monitoring Unit's recommendations by filing requested rule changes or complaints with the Commission, the Market Monitoring Unit shall make its views known to the Commission staff and the PJM Members, either orally or in writing.

5. Consult with Authorized Government Agencies concerning the need for specific investigations or monitoring activities.

6. Consider and evaluate a broad range of additional enforcement mechanisms that may be necessary to assure compliance with the PJM Market Rules. As part of this evaluation process, the Market Monitoring Unit shall consult with Authorized Government Agencies and other interested parties.

7. Report directly to the Commission staff on any matter.

**D. <u>Confidentiality</u>:**

1. All discussions between the Market Monitoring Unit and Market Participants concerning the informal resolution of compliance issues initially shall remain confidential, subject to the provisions in subsection IV.D.3.

2. Except as provided in subsection IV.D.3, in exercising its authority to take Corrective Actions, the Market Monitoring Unit shall observe the confidentiality provisions of the PJM Operating Agreement.

3. Notwithstanding anything to the contrary in this Plan or the PJM Operating Agreement, the Market Monitoring Unit: (a) may disclose any information to the Commission in connection with the reporting required under sections IV.A and IV.B of the Plan, provided that any written submission to

the Commission that includes information that is confidential under the PJM Operating Agreement shall be accompanied by a request that the information be maintained as confidential, and (b) may make reports, complaints, or other regulatory filings pursuant to section IV.C or VII of this Plan if accompanied by a request that information that is confidential under the PJM Operating Agreement be maintained as confidential.

## V. MARKET MONITORING UNIT

A. **Establishment:** PJM shall establish, and provide appropriate staffing and resources to, the Marketing Monitoring Unit, an organization within PJM that shall be responsible for implementing this Plan.

B. **Composition:** The Market Monitoring Unit shall be comprised of full-time employees of PJM having the experience and qualifications necessary to implement this Plan. In carrying out its responsibilities, the Market Monitoring Unit may retain such consultants and experts as it deems necessary, subject to the oversight of the President and/or the PJM Board.

C. **Accountability and Responsibilities:** The Market Monitoring Unit shall be accountable to the President and the PJM Board regarding the implementation of this Plan.

D. **Resources:** The President shall ensure that the Market Monitoring Unit has adequate resources, access to required information, and cooperation of PJM for the effective functioning of the Market Monitoring Unit.

E. **Referral by President and Market Monitoring Unit:** To the extent that they deem desirable, the President and Market Monitoring Unit shall each have independent authority to refer any matters governed by this Plan to the PJM Board for review or approval.

## VI. SPECIFIC MONITORING FUNCTIONS

A. **Primary Information Sources:** The Market Monitoring Unit shall rely primarily upon data and information that is customarily gathered in the normal course of business of PJM along with such publicly available data and information that may be helpful to accomplish the objectives of the Plan. The data and information available to the Market Monitoring Unit shall include, but not be limited to, information gathered or generated by PJM in connection with its scheduling and dispatch functions, its operation of the transmission grid in the PJM Region, its determination of Locational Marginal Prices, information required to be provided to PJM in accordance with the PJM Tariff, the PJM Operating Agreement, the PJM Reliability Assurance Agreements, the Reliability Assurance Agreement South and the Reliability Assurance Agreement West and any other information that is in the possession of PJM.

B. **Other Information Requests:** If other information is required, the Market Monitoring Unit shall comply with the following procedures:

1. **Request for Additional Data:** If the Market Monitoring Unit determines that additional information is required to accomplish the objectives of the Plan, the Market Monitoring Unit may request the entities possessing such information to provide the information on a voluntary basis. Any such request for additional information will be accompanied by an explanation of the need for the information and the Market Monitoring Unit's inability to acquire the information from alternate sources.

2. **Failure to Comply with Request:** The information request recipient shall provide the Market Monitoring Unit with all information that is reasonably requested. If an information request recipient does not provide requested information within a reasonable time, the Market Monitoring Unit may initiate such regulatory or judicial proceedings to compel the production of such information as may be available and deemed appropriate by the Market Monitoring Unit, including petitioning the Commission for an order that the information is necessary and directing its production. An information request recipient shall have the right to respond to any such petitions and participate in the proceedings thereon.

3. **Information Concerning Possible Undue Preference:** Notwithstanding subsection B.1, if the Market Monitoring Unit requests information relating to possible undue preference between Transmission Owners and their affiliates, Transmission Owners and their affiliates must provide requested information to the Market Monitoring Unit within a reasonable time, as specified by the Market Monitoring Unit; provided, however, that an information request recipient may petition the Commission for an order limiting all or part of the information request, in which event the Commission's order on the petition shall determine the extent of the information request recipient's obligation to comply with the disputed portion of the information request.

4. **Confidentiality:** Except as provided in section IV.D.3 of this Plan, the Market Monitoring Unit shall observe the confidentiality provisions of the PJM Operating Agreement with respect to information provided under this section if an entity providing the information designates it as confidential.

C. **Complaints:** Any Market Participant or other interested entity may at any time submit information to the Market Monitoring Unit concerning any matter relevant to the Market Monitoring Unit's responsibilities under the Plan, or may request the Market Monitoring Unit to make inquiry or take any action contemplated by the Plan. Such submissions or requests may be made on a confidential basis. The Market Monitoring Unit may request further information from such Market Participant or other entity and make such inquiry that the Market Monitoring Unit considers appropriate. Neither the Market Monitoring Unit nor PJM Board shall be required to act with respect to any specific complaint unless the Market Monitoring Unit or, if appropriate, the PJM Board, determines action to be warranted.

D. <u>Collection and Availability of Information</u>: The Market Monitoring Unit shall regularly collect and maintain the information that it deems necessary for implementing the Plan. The Market Monitoring Unit shall make publicly available a detailed description of the categories of data collected by the Market Monitoring Unit. To the extent it deems appropriate and upon specific request, the Market Monitoring Unit may release other data to the public, consistent with PJM's obligations to protect confidential, proprietary, or commercially sensitive information.

E. <u>Market Monitoring Indices</u>: The Market Monitoring Unit shall develop, and shall refine on the basis of experience, indices or other standards to evaluate the information that it collects and maintains. Prior to using any such index or standard, the Market Monitoring Unit shall provide PJM Members, Authorized Government Agencies, and other interested parties an opportunity to comment on the appropriateness of such index or standard. Following such opportunity for comments, the decision to use any index or standard shall be solely that of the Market Monitoring Unit.

F. <u>Evaluation of Information</u>: The Market Monitoring Unit shall evaluate, and shall refine on the basis of experience, the information it collects and maintains, or that it receives from other sources, regarding the operation of the PJM Market or other matters relevant to the Plan. As so evaluated, such information shall provide the basis for reports or other actions of the Market Monitoring Unit under this Plan.

## VII. <u>REPORTS</u>

A. <u>Reports to the PJM Board</u>: The Market Monitoring Unit shall prepare and submit to the PJM Board and to the PJM Members Committee, annual state-of-the-market reports on the state of competition within, and the efficiency of, the PJM Market. In such reports, the Market Monitoring Unit may make recommendations regarding any matter within its purview. The reports to the PJM Board shall include recommendations as to whether changes to the Market Monitoring Unit or the Plan are required. In addition, the Market Monitoring Unit shall provide to the PJM Board, in a timely manner, copies of any reports submitted to Authorized Government Agencies pursuant to Section VII.B. The Market Monitoring Unit may from time-to-time submit additional reports to the PJM Board as the Market Monitoring Unit may deem appropriate in the discharge of its responsibilities under Section III hereof.

B. <u>Reports to Government Agencies</u>: The Marketing Monitoring Unit shall contemporaneously submit to the Authorized Government Agencies the reports provided to the PJM Board pursuant to Section VII.A. Subject to applicable law and regulation and any other applicable provisions of the PJM Operating Agreement or PJM Tariff, the Market Monitoring Unit shall, to the extent practicable, respond to reasonable requests by Authorized Government Agencies other than the Commission for reports provided to the PJM Board, subject to protection of confidential, proprietary and commercially sensitive information and the protection of the confidentiality of ongoing inquiries and monitoring activities.

C. **Public Reports:** The Market Monitoring Unit shall prepare a detailed public annual report about the Market Monitoring Unit's activities, subject to protection of confidential, proprietary, and commercially sensitive information and the protection of the confidentiality of ongoing investigations and monitoring activities. The Market Monitoring Unit may, instead of filing a separate report, include the referenced material in a report filed pursuant to Section VII.A hereof.

## VIII. AUDIT

The activities of the Market Monitoring Unit shall be audited in accordance with procedures adopted from time to time by the PJM Board.

## IX. LIABILITY

Any liability of PJM arising under or in relation to this Plan shall be subject to this Section IX. The PJM Entities shall not be liable to any Market Participant, any party to the PJM Operating Agreement, any customer under the PJM Tariff, or any other person subject to this Plan in respect of any matter described in or contemplated by this Plan, as the same may be amended or supplemented from time to time, including but not limited to liability for any financial loss, loss of economic advantage, opportunity cost, or actual or consequential damages of any kind resulting from or attributable to any act or omission of any of the PJM Entities under this Plan.

## X. OTHER RELIEF NOT FORECLOSED

**A. Preservation of Rights:** Nothing herein shall prevent PJM or any other person from asserting any rights it may have under the Federal Power Act or any other applicable law, statute, or regulation, including the filing of a petition with or otherwise initiating a proceeding before the Commission regarding any matter which is the subject of this Plan.

**B. Alternate Dispute Resolution:** Notwithstanding any provision of the PJM Tariff or the PJM Operating Agreement, PJM and the Market Monitoring Unit shall not be required to use the dispute resolution procedures in the PJM Tariff or the PJM Operating Agreement in carrying out its duties and responsibilities under this Plan. However, nothing herein shall prevent PJM or any other person from requesting the use of the dispute resolution procedure set forth in the PJM Tariff or the PJM Operating Agreement, as applicable.

## XI. EFFECTIVE DATE

This Plan shall be effective as of the date it is accepted for filing by the Commission.

# Organization of PJM States, Inc. (OPSI)

President: **Mark C. Christie** (Commissioner, Virginia SCC)
Vice President: **Lula Ford** (Commissioner, Illinois CC)
Secretary: **Allen M. Freifeld** (Commissioner, Maryland PSC)
Treasurer: **Dallas Winslow** (Commissioner, Delaware PSC)

*Members: Delaware Public Service Commission, District of Columbia Public Service Commission, Illinois Commerce Commission, Indiana Utility Regulatory Commission, Kentucky Public Service Commission, Maryland Public Service Commission, Michigan Public Service Commission, New Jersey Board of Public Utilities, North Carolina Utility Commission, Public Utility Commission of Ohio, Pennsylvania Public Utility Commission, Tennessee Regulatory Authority, Virginia State Commerce Commission, and West Virginia Public Service Commission.*

Executive Director: Rajnish Barua, Ph.D.
P.O. Box 8906, Newark, DE 19714-8906
Email: opsi-ed@comcast.net; Tel: 302-266-0914


May 25, 2007

Kimberly D. Bose, Secretary
Philis Posey, Deputy Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Re: **Organization of PJM States, Delaware Public Service Commission; District of Columbia Public Service Commission; Indiana Utility Regulatory Commission; Kentucky Public Service Commission; Maryland Public Service Commission; New Jersey Board of Public Utilities; North Carolina Utilities Commission; Public Utility Commission of Ohio; Pennsylvania Public Utility Commission; and the Virginia State Corporation Commission v. PJM Interconnection;** Answer of the Organization of PJM States, Inc. to March 24, 2007 Motion of Joseph Bowring for Extension of Time and Motion to Supplement Commission Data Requests

Dear Secretary Bose:

Please accept for filing in the above-referenced matter an electronically filed *Answer of the Organization of PJM States, Inc.to the March 24th 2007 Motion of Dr. Joseph Bowring for Extension of Time and Motion to Supplement Commission Data Requests* in the above captioned matter.

Service of this motion has been made in accordance with the Commission's rules as evidenced by the attached certificate of service. Thank you for your attention to this matter. If you have any questions in reference to this filing, please contact me at 717-787-5978.

Sincerely,

s/ John A. Levin
John A. Levin
Assistant Counsel
Pennsylvania Public Utility Commission
For: The Organization of PJM States, Inc.

Enclosure

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

| | | |
|---|---|---|
| **Organization of PJM States, Inc.; Delaware Public Service Commission; District of Columbia Public Service Commission; Indiana Utility Regulatory Commission; Kentucky Public Service Commission; Maryland Public Service Commission; New Jersey Board of Public Utilities; North Carolina Utilities Commission; Public Utilities Commission of Ohio; Pennsylvania Public Utility Commission; and the Virginia State Corporation Commission** | : | **Docket No. EL07-58-000** |
| **Petitioners,** | : | |
| **v.** | : | |
| **PJM Interconnection, L.L.C.,** | : | |
| **Respondent** | : | |

**ANSWER OF THE ORGANIZATION OF PJM STATES, INC. SUPPORTING THE MARCH 24TH 2007 MOTION OF DR. JOSEPH BOWRING FOR EXTENSION OF TIME AND MOTION TO SUPPLEMENT COMMISSION DATA REQUESTS**

Pursuant to Rules 101(e), 212 and 213 of the Federal Energy Regulatory Commission's ("Commission" or "FERC") Rules of Practice and Procedure[1], the Organization of PJM States, Inc., ( "OPSI") hereby submits this Answer supporting the

[1] 18 C.F.R. §§385.101(e) and 385.213.

Motion of Dr. Joseph Bowring for a two week extension of time in which to submit responses to the Commission's May 18, 2007 data requests.

## SUMMARY

1. OPSI does not oppose, and indeed supports Dr. Bowring's request for a two week extension, and would also support a similar two week extension for PJM's response. While OPSI continues to request expeditious resolution of this issue, it should be done on the basis of a full record. OPSI continues to urge the importance of maintaining a fully functional market monitoring unit as the *status quo ante* and its request for interim relief is directed to that purpose.

2. OPSI moves the Commission to supplement the Commission's data requests with additional requests to both PJM and Dr. Bowring contained in Appendix A.

Questions 1 and 2, which request information directly related to the allegations of interference at issue in this proceeding, should be responded to at the same time as the Commission's initial requests are due.

Questions 3 – 14, which request information about PJM's independent internal investigation are not immediately critical to resolution of the request for interim relief now under review by your Commission and therefore may be responded to at a later time. As OPSI and other parties have requested that this matter be set for hearing, a request not yet granted by the Commission, these data requests are not intended to be substitutes for any discovery that may be afforded parties when the matter is set for hearing.

3. Finally, while PJM's internal investigation cannot substitute for or delay a full and searching investigation of these allegations by your Commission, OPSI would support the completion of a truly unbiased, transparent and thorough independent investigation commissioned by PJM that provides the PJM Board of Managers, the Commission, the parties to this consolidated proceeding and PJM's many stakeholders with a full and thoughtful accounting of the facts and events at issue and the underlying causes for them.

## I. ANSWER

OPSI does not oppose Dr. Bowring's request for a two week extension, and would ask your Commission to provide PJM with the same amount of additional time in which to respond to its data requests. While OPSI has urged that this matter be fast tracked, a thorough investigation of this issue is essential to ensure confidence in the PJM wholesale markets.

## II. MOTION TO SUPPLEMENT COMMISSION DATA REQUESTS

OPSI requests that the Commission supplement its May 18, 2007 data requests with the additional suggested supplemental data requests that appear in the Appendix to this Answer and Motion.

Questions 1 – 2 should be returnable at the same time as the Commission's data requests, while Questions 3 – 14 (which request information about the scope, degree of independence and transparency of the PJM internal investigation) may be returnable at a later time. OPSI does not intend that these supplemental questions should substitute for party discovery during a hearing of this matter.

OPSI urges that the Commission allow the parties to obtain sufficient information so that they may have a full understanding of the events underlying the allegations at issue and a full understanding of the scope, degree of independence and transparency of the ongoing PJM internal investigation.

## III. THE COMMISSION SHOULD REQUIRE PJM TO COMPLETE ITS INTERNAL INVESTIGATION AND SUBMIT THE RESULTS AND DATA FOR THE RECORD

While OPSI and other Complainants have taken the position that PJM's independent investigation cannot either delay or serve as a substitute for a thorough investigation by the Commission, it is important that PJM's independent investigation be completed, and that its bases and results are shared with the Commission and the parties to this proceeding.

Assuming the investigation is conducted with sufficient rigor, transparency and independence, is informed by full access to PJM's internal documents and personnel, and its results and data are made available to the Board of Managers, the Commission, the Complainants and PJM's stakeholders, the PJM independent investigation may usefully supplement this investigation and provide public confidence that the matter has been thoroughly reviewed.

Conversely, should the PJM independent investigation should be short circuited, that can only have an adverse effect on public confidence in PJM's commitment to openness and transparency and its public commitment to tariff compliance and market monitoring independence.

## CONCLUSION

**WHEREFORE**, the Organization of PJM States, Incorporated respectfully requests your Commission to grant both Dr. Joseph Bowring and PJM a two week extension of time in which to respond to its Data Requests, require PJM and Dr. Bowring to supplement their responses as indicated in this pleading, and state that PJM should continue and complete its independent investigation of this matter and submit the results and data of that investigation for review by your Commission and parties to this proceeding.

Respectfully submitted,

s/ John A. Levin
John A. Levin
Assistant Counsel
Pennsylvania Public Utility Commission
P.O Box 3265
Harrisburg, PA 171053265
(717) 787-5978
johlevin@state.pa.us

**For the Organization of PJM States, Inc.**

## CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document in accordance with the requirements of the Commission's Rules of Practice and Procedure.

Dated at Harrisburg, Pennsylvania this 25th day of May, 2007.

s/ John A. Levin
John A. Levin
Assistant Counsel
Pennsylvania Public Utility Commission
P.O. Box 3265
Harrisburg, PA 17105-3265
(717) 787-5978
johlevin@state.pa.us

APPENDIX "A"

Proposed Supplemental Data Requests

1. Please state whether any member of PJM management has communicated to anyone a present or future intention to remove or restrict access to or control of Market Monitoring Unit information services, databases, employees or other assets from the market monitoring unit, and the market monitor. If yes, state the names, positions and business addresses of all parties to such communication, and supply all documents relating to such communication.

2. Please state whether PJM has commissioned any investigation, study, audit or review of the PJM Market Monitoring Unit or the PJM market monitor by any outside consultant or contractor prior to April 5, 2007. If yes, supply copies of each such investigation report, study, audit or review.

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3. Please supply the name, affiliation, business address and telephone contact number of each individual retained or employed by PJM or its contractors, subcontractors, agents or representatives to conduct the PJM Internal Investigation. For the purposes of this question and the following questions, **"PJM Internal Investigation"** means the internal investigation identified as "the PJM Board of Managers' announced independent investigation" or any similar investigation referred to on page 1 of your May 3, 2007 Answer to the Complaint docketed by FERC at EL07-58.

4. Please supply the name, affiliation, job description, business address and telephone contact number of each individual employed by PJM that has been designated to assist in conducting the PJM Internal Investigation.

5. Please supply any retention letters, documents or instructions by PJM or any of its representatives, agents, employees(?) or contractors that define the nature, scope and timing of the PJM Internal Investigation, any interim milestones or reports.

6. What specific conditions of access or limitations to access do the investigators have to documents related to the PJM Internal Investigation held by PJM, PJM members, PJM employees, agents or contractors?

7. What opportunity for review, comment or editorial change of any interim or pre-release final version of the Investigational Report will be given to the PJM Board of

Managers, any PJM employee, agent or contractor, any PJM member or any person interviewed during the course of the investigation?

8. Please state the date when the final PJM Internal Investigation report and any interim or draft report will be completed and identify all persons to whom each such report will be transmitted.

9. Please state whether, and if not, why not, any interim or draft report is will be made available to the Federal Energy Regulatory Commission, the Complainants in Docket Nos. EL07-58 or EL07-56, PJM Members and/or the general public. Identify each person to whom each such report will be made available and when each such report will be made available.

10. Please state whether, and if not, why not, the final PJM Internal Investigation report will be made available to the Federal Energy Regulatory Commission, the Complainants in Docket Nos. EL07-58 or EL07-56, PJM Members and/or the general public. Identify each person to whom such report will be made available and when such report will be made available.

11. Please identify the name, affiliation, job description, business address and telephone contact number of each individual serving as a custodian of documents, records or other investigational materials.

12. Please identify the physical location of all documents, records or other investigational materials obtained by or produced as a result of the PJM Internal Investigation.

13. Please state whether PJM asserts or intends to assert any legal or other privilege against disclosure of the PJM Internal Investigation report and/or investigational documents upon which the report is based to:

a. The Federal Energy Regulatory Commission
b. The Organization of PJM States, Inc.
c. Any or all of the State Commissions signatory to the Complaint docketed by the Federal Energy Regulatory Commission at EL07-58.
d. Any or all of the signatories to the Complaint filed at EL07-56.

If "yes", identify with respect each such privilege, against whom asserted and the legal or other basis of such privilege.

14. Are you aware of any ongoing or proposed investigation by a state or federal regulatory body or other entity (other than the Federal Energy Regulatory Commission)

with regard to the operation or structure of the PJM market monitor, the market monitoring unit or PJM's market monitoring plan?

a. If yes, list all such investigations individually and provide copies of all discovery sought and/or provided in connection with such investigation.

**UNITED STATES OF AMERICA**
**BEFORE THE**
**FEDERAL ENERGY REGULATORY COMMISSION**

| | | |
|---|---|---|
| Organization of PJM States, Inc.; | ) | |
| Delaware Public Service Commission; | ) | |
| District of Columbia Public Service Commission; | ) | |
| Indiana Utility Regulatory Commission; | ) | |
| Kentucky Public Service Commission; | ) | |
| Maryland Public Service Commission; | ) | |
| New Jersey Board of Public Utilities; | ) | |
| North Carolina Utilities Commission; | ) | |
| Public Utilities Commission of Ohio; | ) | |
| Pennsylvania Public Utility Commission; | ) | |
| and the Virginia State Corporation Commission | ) | |
| | ) | |
| v. | ) | Docket No. EL07-58-000 |
| | ) | |
| PJM Interconnection, L.L.C. | ) | |

**ANSWER OF**
**PJM INTERCONNECTION, L.L.C.**
**TO COMPLAINT AND MOTION FOR INTERIM RELIEF**

PJM Interconnection, L.L.C. ("PJM"), pursuant to the Commission's rules, hereby answers the "Complaint Requesting Fast Track Processing and Motion for Interim Relief," filed on April 23, 2007 ("OPSI Complaint") by the Organization of PJM States, Inc. and certain state commissions (collectively, "OPSI") regarding the PJM Market Monitoring Unit ("MMU"). The OPSI Complaint rests on the same grounds, and seeks much the same relief, as a similar complaint filed days earlier in Docket No. EL07-56-000 ("EL07-56 Complaint"). For the same reasons given in PJM's April 30, 2007 answer in that proceeding ("April 30 Answer"), the Commission should dismiss the OPSI Complaint as unsupported, or hold it in abeyance pending the completion of the PJM Board of Managers' announced independent investigation. The Commission also should deny the Complaint's request for interim relief. As shown in the April 30 Answer, unless and until the Commission approves a change in PJM's market monitoring structure, PJM has no intention to decrease the MMU's budget, staffing, or access to all of the databases it always has used to monitor the markets. Accordingly, there is no basis or need for Commission intervention.

The OPSI Complaint also seeks additional relief that is unwarranted at this juncture. It departs from the EL07-56 Complaint by asking the Commission not only to grant interim relief, but also affirmatively to amend the PJM tariff provisions establishing the current internal PJM market monitoring structure so as to change radically its corporate reporting, budget, and employment relationships. The Commission should not act on the Complaint's proposed changes to the current internal MMU structure. Rather, the Commission should await the results of PJM's current review of its market monitoring structure, which it expects to present to its Board for consideration in approximately 60 days. If that review results in changes in the structure now prescribed by the PJM Tariff, it will require an implementing filing with the Commission that will provide a forum for adjudication of the policy issues raised by OPSI in its complaint. There is little sense in addressing OPSI's proposed changes in isolation when the PJM Board may be submitting its own proposed changes shortly. In any event, OPSI's requested tariff changes are insufficiently supported to meet the standards of section 206 of the Federal Power Act. Moreover, the extraordinary request that the Commission interfere in PJM's internal corporate structure by directing MMU reporting relationships, budgeting, employee discipline and discharge procedures, and similar matters, seeks remedies that likely exceed the Commission's authority under the Federal Power Act ("FPA").

## SUMMARY

As in the case of the EL07-56 Complaint, the OPSI Complaint's allegations rest entirely upon the recent brief comments of the PJM Market Monitor, Mr. Bowring, at a Commission technical conference. As shown in the April 30 Answer (a copy of which is attached), Mr. Bowring's non-specific and unsubstantiated assertions are currently the subject of a thorough independent counsel investigation initiated by the PJM Board of Managers. Before the Commission takes any action, it should allow the independent PJM Board to investigate the facts concerning Mr. Bowring's assertions and report them to the Commission, as the Board already has assured the Commission it will do.

Similarly, OPSI's demand for interim relief to assure proper continued market monitoring simply accepts all of Mr. Bowring's assertions as true, adding only suppositions and speculations to those assertions, but with no other factual support beyond Mr. Bowring's brief statements. This is precisely why the Board has commissioned an independent investigation so as to ensure that facts substitute for supposition and innuendo.

The fears OPSI raises in its request for interim relief are not supported by the record. As set forth in its April 30 answer, PJM has assured the Commission that it fully supports its MMU with the resources needed to perform its market monitoring functions, and that support has not diminished. The MMU's access to data <u>is unchanged</u> (the market monitor has never stated otherwise), and will remain unchanged pending the submission to the Commission of the results of the Board's investigation; and the MMU's budget and authorized resources are greater this year than they were last year. While a few MMU staff members have from time to time availed themselves of the opportunity afforded to all PJM employees to bid on other PJM job postings, PJM has put in place retention compensation measures to encourage MMU employees to remain with the MMU through the period of consideration of any alternative market monitoring structures. PJM also has developed transitional measures for the few employees that have transferred out of the MMU, so that they will continue to devote a substantial share of their time to MMU activities, further ensuring that the MMU has adequate resources to meet its market monitoring responsibilities.

The Commission also need not and should not act on OPSI's request for an immediate change in the internal corporate reporting structure of the PJM MMU. OPSI prematurely seeks to have the Commission direct that an internal PJM MMU report either to a newly established Federal-State Board, or directly to the PJM Board. OPSI further proposes that budgets and personnel actions be subject to approval by the Commission. The Commission need not struggle with the novel and difficult questions posed by OPSI's request that the Commission dictate an internal MMU with none of the attributes of an internal corporate department. As PJM already has informed the Commission, PJM currently is considering the risks and benefits of using an external market monitor, based on the practices of the other ISOs and RTOs approved by the Commission. PJM expects to complete that review within 60 days, and promptly present such findings to the PJM Board for review. The PJM Board thereafter will decide whether to file tariff changes with the Commission. As noted in its April 30 Answer, the PJM Board's determination will be informed by the results of the ongoing independent investigation. As Commission approval of any change to an external market monitor, if proposed by the PJM Board, would largely eliminate the need to address the Complaint's request for changes to the current internal structure, the Commission should await the Board's review and report before acting as OPSI proposes.

## ANSWER

### I. The OPSI Complaint Largely Repeats the Allegations and Requested Relief of the EL07-56 Complaint, Which PJM Already Has Answered.

The OPSI Complaint makes essentially the same allegations, claims the same tariff violations, and seeks largely the same relief as the earlier complaint in Docket EL07-56. The OPSI Complaint repeats, restates and re-characterizes the earlier similar allegations, but the only basis offered for any of its charges is the same brief technical conference comments of Mr. Bowring. Even where the OPSI Complaint's re-packaging of Mr. Bowring's comments goes beyond his actual statements,[1] no support whatsoever is offered except Mr. Bowring's unsubstantiated brief statements at the technical conference.

Therefore, for the reasons already given in PJM's April 30 Answer, a copy of which is attached, the Commission should deny the OPSI Complaint, or at a minimum hold it in abeyance pending the completion of the PJM Board of Managers' announced independent investigation.

As more fully explained by PJM management in the April 30 Answer:[2]

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1 See, e.g., Complaint at 13 (listing alleged actions claimed to violate PJM's Tariff); Complaint at 10-11 (falsely claiming that "senior PJM management has recently threatened to remove or actually has removed information systems and data from the MMU's custody and control" and "has recently attempted to abruptly downsize the MMU"); Complaint at 17 (erroneously asserting that PJM "seeks to compel the MMU to conform its expert opinions and findings to the preconceived views of the RTO" and to "simply parrot the opinions of RTO management"); Complaint at 25 (asserting without factual support that PJM actions are directed at "*de facto* elimination" of the MMU).

2 As in the case of the earlier complaint, PJM is compelled to address the OPSI complaint without the benefit of the independent factual investigation because of the Complaint's demands for immediate relief. The discussion in the text is PJM management's response.

- Mr. Bowring's brief and non-specific statements, made at a technical conference where a large number of witnesses were provided only a few minutes to make presentations and answer the Commission's policy questions, simply do not rise to the level of record evidence sufficient to support a complaint.

- Rather than engage in a breathless rush to judgment, the PJM Board has ordered a thorough investigation by independent counsel to identify and communicate all facts associated with Mr. Bowring's assertions. The Board has promised to do so "expeditiously, without sacrificing thoroughness," and has assured the Commission that the resulting comprehensive report will be provided to the Commission.

- It would be irresponsible for PJM to respond without the Board's completing its investigation into the precise nature of the accusations and the facts surrounding them. As the Complaint does nothing more than repeat Mr. Bowring's unsubstantiated factual allegations, adding only innuendo and suggestion, it does not support its requested findings or remedies. Consistent with its precedent, the Commission should therefore dismiss the Complaint or, at the very least, hold it in abeyance until the Commission receives the PJM Board's report.[3]

- Far from "dismantling" the MMU, PJM has substantially expanded the MMU in the past several years, at a pace faster than the growth of PJM's other departments. PJM increased the MMU's budget by over 70% from 2004 to 2006, and by another 11% from 2006 to 2007. Similarly, PJM increased the budgeted personnel resources for the MMU from 16 full-time equivalent staff for 2004 to 19 full-time equivalent staff augmented by contract workers providing the equivalent of an additional three full-time employees for 2007. Notably, the amount PJM budgets for the MMU has in every year significantly exceeded the amount actually spent by the MMU in the prior year.

- PJM management's meeting with MMU staff before the 2007 PJM Strategic Report was released reflected good management practice and common courtesy. PJM appropriately advised them in advance of the report's recommendation to consider use of an external market monitor.

- The 2007 Strategic Report's recommendation to study and consider the risks and benefits of using an external market monitor raises no legitimate concerns about the viability or independence of the market monitor, or PJM's compliance with its

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3 The OPSI Complaint asserts (at 3) that the pending investigation "has no bearing" on the complaint. To the contrary, the only basis offered for the OPSI Complaint is the technical conference statements of Mr. Bowring, and those very statements are the subject of the pending investigation, intended to determine the facts underlying those statements.

tariff. Every other ISO/RTO approved by the Commission relies in whole or in part on an external market monitor, and all have been found to comply with Order 2000.

- The facts concerning the PJM job postings cited by the Market Monitor hardly constitute a "dismantling" of the MMU. PJM allows all PJM employees to bid on any PJM job postings, and PJM does not believe it would be appropriate to deny this opportunity to an employee solely because he or she works in the MMU. Two MMU employees successfully bid on PJM positions and are scheduled to transfer out of the MMU this month. However, PJM is developing transition plans so that both employees continue to devote a significant portion of their time to the MMU until replacements can be found, and has implemented a retention plan that will pay each MMU employee that remains with the MMU through the completion of the consideration of any alternative market monitor structure a substantial project completion bonus.

- The MMU retains completely unfettered access to all of the databases that it has used in the past, and continues to use, to monitor the PJM markets, as well as any and all other PJM data that it requires. The only potential change regarding data that PJM is considering is changing the designated security "stewardship" of certain databases used by the MMU, solely to facilitate access by the Market Services Department to the data relating to the historical operation of PJM's markets, not to "remove" or diminish access by the MMU to that data in any manner whatsoever. However, as this change has not yet been implemented, PJM will defer any change, pending submission of the results of the Board's investigation to the Commission.

## II. The Commission Should Not Act on OPSI's Proposed Tariff Modifications to the Internal MMU Structure, in Advance of PJM's Consideration of an External Market Monitor and Report to the Commission.

While the OPSI Complaint generally makes the same allegations, and requests the same relief, as the EL07-56 Complaint, the OPSI Complaint goes even further and adds a request (at 33) that the Commission find unjust and unreasonable the existing PJM Tariff provisions that the MMU report to the PJM President. It asks the Commission to direct instead that "a Joint Federal State Board . . . supervise the PJM MMU," or, in the alternative, that the Commission remove the MMU "from direct or indirect supervision by any officer or employee of PJM" and direct that "the MMU be supervised directly by the PJM Board of Managers" except that any action by the PJM Board regarding "the discipline or discharge" of MMU personnel would have to be "the subject of formal notice to and review by the Commission." The Complaint (at 35) even asks broadly that the Commission order that "budget, retention and discipline of [MMU] personnel would be the subject of required notice to and approval by your Commission."

The Commission should not take any action now on Complainants' unprecedented request that the Commission preserve a particular structure for market monitoring, without even hearing the PJM Board's evaluation of the matter, no less take action to add unique and untested rules for the supervision, administration, and accountability of market monitoring employees. As explained above, there is no basis for the Commission to address this sweeping and unprecedented proposal on an emergency basis -- PJM has affirmed to the Commission that it is taking none of the steps alleged and, in fact, has undertaken steps such as retention programs to ensure continued proper market monitoring. PJM is currently reviewing the possible use of an external market monitor,[4] and expects to complete that review within 60 days. The Commission can await that review,[5] without rushing to judgment as proposed by the complaint.

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4 Notably, the Commission has approved external market monitors for all of the other approved ISOs and RTOs. See Southwest Power Pool, Inc., 114 FERC ¶ 61,289, at P 134 (2006); Midwest Indep. Transmission Sys. Operator, Inc., 101 FERC ¶ 61,228, at P 1 (2002); N.Y. Indep. Sys. Operator, Inc.; 96 FERC ¶ 61,059, at 61,199 (2001); ISO-New England Inc., 106 FERC ¶ 61,280, PP 181, 187 (2004); California Independent System Operator Corp., FERC Electric Tariff, Third Replacement Vol. No. II, Appendix P2, Orig. Sheet No. 963, et seq.

5 The Commission has previously affirmed that PJM has the authority unilaterally to file changes to its market monitoring plan under section 205 of the Federal Power Act. PJM Interconnection, L.L.C., 86 FERC ¶ 61,247, at 61,890 (1999) ("greater control over the process of changing the monitoring and investigative rules of the MMU better lies with the PJM Board than with the PJM members, who will be subject to the MMU's monitoring and investigations").