

SECTION 4 – INTERCHANGE TRANSACTIONS

PJM market participants import energy from, and export energy to, external regions continuously. The transactions involved may fulfill long-term or short-term bilateral contracts or take advantage of short-term price differentials. The external regions include both market and non market balancing authorities.

Overview

Interchange Transaction Activity

- Aggregate Imports and Exports in the Real-Time Market.** During the first three months of 2010, PJM was a net exporter of energy in the Real-Time Market in all months. The Real-Time monthly net interchange averaged -281 GWh.¹ Gross monthly import volumes averaged 3,837 GWh while gross monthly exports averaged 4,118 GWh.
- Aggregate Imports and Exports in the Day-Ahead Market.** During the first three months of 2010, PJM was a net exporter of energy in the Day-Ahead Market in all months. The Day-Ahead monthly net interchange averaged -260 GWh. Gross monthly import volumes averaged 5,182 GWh while gross monthly exports averaged 5,442 GWh.
- Aggregate Imports and Exports in the Day-Ahead Market versus the Real-Time Market.** During the first three months of 2010, gross imports in the Day-Ahead Energy Market were 135 percent of the Real-Time Market's gross imports (111 percent for the calendar year 2009), gross exports in the Day-Ahead Market were 132 percent of the Real-Time Market's gross exports (127 percent for the calendar year 2009) and net interchange in the Day-Ahead Energy Market was 93 percent of net interchange in the Real-Time Energy Market (-842 GWh in the Real-Time Market and -781 GWh in the Day-Ahead Market).
- Interface Imports and Exports in the Real-Time Market.** In the Real-Time Market, during the first three months of 2010, there were net exports at 11 of PJM's 21 interfaces. The top three net exporting interfaces in the Real-Time Market accounted for 73 percent of the total

net exports: PJM/New York Independent System Operator, Inc. (NYIS) with 28 percent, PJM/Neptune (NEPT) with 23 percent and PJM/MidAmerican Energy Company (MEC) with 22 percent of the net export volume. There are three separate interfaces that connect PJM to the NYISO (PJM/NYIS, PJM/NEPT and PJM/Linden (LIND)). Combined, these interfaces made up 57 percent of the total net PJM exports in the Real-Time Market. Eight PJM interfaces had net imports, with two importing interfaces accounting for 78 percent of the total net imports: PJM/Ohio Valley Electric Corporation (OVEC) with 61 percent and PJM/Michigan Electric Coordinated System (MECS) with 17 percent.²

- Interface Imports and Exports in the Day-Ahead Market.** In the Day-Ahead Market, there were net exports at 12 of PJM's 21 interfaces. The top four net exporting interfaces accounted for 84 percent of the total net exports: PJM/MEC with 36 percent, PJM/western Alliant Energy Corporation (ALTW) with 20 percent, PJM/Neptune (NEPT) with 15 percent and PJM/NYIS with 13 percent. Eight PJM interfaces had net imports in the Day-Ahead Market, with two interfaces accounting for 89 percent of the total net imports: PJM/OVEC with 58 percent and PJM/Michigan Electric Coordinated System (MECS) with 31 percent.³

Interactions with Bordering Areas

PJM Interface Pricing with Organized Markets

- PJM and Midwest Independent System Operator (MISO) Interface Prices.** During the first three months of 2010, the relationship between prices at the PJM/MISO Interface and at the MISO/PJM Interface reflected economic fundamentals as did the relationship between interface price differentials and power flows between PJM and the Midwest ISO. Over the first three months of 2010, the PJM average hourly Locational Marginal Price (LMP) at the PJM/MISO border was \$34.82 while the Midwest ISO LMP at the border was \$35.20, a difference of \$0.38. While the average hourly flow reflected imports into PJM from the Midwest ISO, further analysis of hourly interchange shows patterns of expected market participant response that created price convergence at the PJM/MISO Interface.

¹ Net interchange is gross import volume less gross export volume. Thus, positive net interchange is equivalent to net imports and negative net interchange is equivalent to net exports.

² In the Real-Time Market, two PJM interfaces had a net interchange of zero.

³ In the Day-Ahead Market, one PJM interface had a net interchange of zero.

- **PJM and New York ISO Interface Prices.** During the first three months of 2010, the relationship between prices at the PJM/NYIS Interface and at the NYISO/PJM proxy bus reflected economic fundamentals, as did the relationship between interface price differentials and power flows between PJM and the NYISO. Both continued to be affected by differences in institutional and operating practices between PJM and the NYISO. Over the first three months of 2010, the PJM average hourly LMP at the PJM/NYISO border was \$45.86 while the NYISO LMP at the border was \$44.06, a difference of \$1.80. While the average hourly flow reflected exports from PJM into the NYISO, further analysis of hourly interchange shows patterns of expected market participant response that created price convergence at the PJM/NYISO Interface.

Operating Agreements with Bordering Areas

- **PJM and New York Independent System Operator, Inc. Joint Operating Agreement (JOA).**⁴ On May 22, 2007, the JOA between PJM and the New York Independent System Operator (NYISO) became effective. This agreement was developed to improve reliability. It also formalizes the process of electronic checkout of schedules, the exchange of interchange schedules to facilitate calculations for available transfer capability (ATC) and standards for interchange revenue metering.

The PJM/NYISO JOA does not include provisions for market based congestion management or other market to market activity, and, in 2008, at the request of PJM, PJM and the NYISO began discussion of a market based congestion management protocol, which continued during the first three months of 2010. By order issued July 16, 2009, the Commission directed the NYISO to “develop and file a report on long-term comprehensive solutions to the loop flow problem, including addressing interface pricing and congestion management, and any associated tariff revisions, within 180 days of the date of this order.”⁵ After working in collaboration with PJM, the Midwest ISO and the Ontario Independent Electricity System Operator (IESO), including an opportunity to comment by stakeholders and market monitors, the NYISO filed on January 12, 2010, a *Report on Broader Regional Markets; Long-Term Solutions to Lake Erie Loop Flow*.⁶

- **PJM and Midwest ISO Joint Operating Agreement.** The Joint Operating Agreement between the Midwest Independent Transmission System Operator, Inc. and PJM Interconnection, L.L.C., executed on December 31, 2003, continued during the first three months of 2010. The PJM/MISO JOA includes provisions for market based congestion management that, for designated flowgates, allow for redispatch of the PJM and MISO regions as though they were one large control area. The MMU believes that this approach should constitute the prevailing industry standard. This conceptual achievement, however, has not been matched by adequate attention to the details of its administration.

The market based congestion management process is reviewed and modified as necessary through the Congestion Management Process (CMP) protocols.⁷ In 2009, the Midwest ISO requested that PJM review the components of the CMP to verify data accuracy. During this review, it was found that some data inputs to the market flow calculator were incorrect during the time period from April 2005 through June 2009. The resulting inaccuracies in the market flow calculation meant that the Midwest ISO received less compensation than appropriate. While the errors in input data have been corrected for market to market activity moving forward, the Midwest ISO and PJM are currently in the process of calculating the shortfall. PJM reported an estimate of 77.5 million dollars.⁸ On March 8, 2010, after the settlement discussions mediated by the Federal Energy Regulatory Commission (FERC) ended, the Midwest ISO filed complaints with FERC against PJM.⁹ The complaints claim that, “By failing to accurately reflect market flows, PJM has caused Midwest ISO participants to be underpaid for congestion relief in the amount of \$130 million dollars between 2005 and 2009,” and that, “PJM has demanded repayment of sums related to mutually agreed use of proxy flowgates, in violation of the JOA, and has failed without explanation to initiate the market to market process when the binding constraint is an RCF under PJM control ... [such that] PJM charges its stakeholders unnecessary costs for congestion, increases PJM generator revenues, and deprives the Midwest ISO generators of revenue.”¹⁰ On April 12, 2010, PJM answered and filed a counter complaint, contending that, “Midwest ISO violated the JOA by improperly initiating the market-to-market process under the JOA using

⁴ See PJM. “Joint Operating Agreement Among And Between New York Independent System Operator Inc. And PJM Interconnection, L.L.C.” (May 22, 2007) (Accessed April 22, 2010) <<http://www.pjm.com/documents/agreements/-/media/documents/agreements/20071102-nyiso-pjm.ashx>> (208 KB).

⁵ 128 FERC ¶61,049 (Ordering Para. B), order on clarification, 128 FERC ¶61,239.

⁶ See NYISO. “Report on Broader Regional Markets: Long-Term Solutions to Lake Erie Loop Flow” Docket No. ER08-1281-004 (January 12, 2010) (Accessed April 22, 2010) <http://www.nyiso.com/public/webdocs/documents/regulatory/filings/2010/01/NYISO_Rpt_BRM_01_12_10FNL.pdf> (131 KB).

⁷ See PJM. “Joint Operating Agreement Between the Midwest Independent Transmission System Operator, Inc. and PJM Interconnection, L.L.C.” (December 11, 2008) (Accessed April 22, 2010) <<http://www.pjm.com/documents/agreements/-/media/documents/agreements/joa-complete.ashx>> (1,294 KB).

⁸ See PJM. “PJM/MISO Market Flow Calculation Error”(September 10, 2009) (Accessed April 22, 2010) <<http://www.pjm.com/committees-and-groups/committees/-/media/committees-groups/committees/mic/20090910/20090910-item-07-m2m-calculation-error.ashx>> (49 KB).

⁹ Complaints of the Midwest Independent Transmission System Operator, Inc., filed Dockets Nos. EL10-45-000 & EL10-46-000 (respectively, MISO Complaint I and MISO Complaint II).

¹⁰ MISO Complaint I at 33; MISO Complaint II at 12.

substitute or proxy flowgates.”¹¹ These matters are now pending before the Commission. The Market Monitor is concerned that this imbroglio over administration of the JOA will unduly detract from its ability to serve as the basis for moving forward industry practice for managing congestion and loop flows at system interfaces.

- **PJM, Midwest ISO and TVA Joint Reliability Coordination Agreement.**¹² The Joint Reliability Coordination Agreement (JRCA) executed on April 22, 2005, provides for comprehensive reliability management among the wholesale electricity markets of the Midwest ISO and PJM and the service territory of TVA. The agreement continued to be in effect through the first three months of 2010.
- **PJM and Progress Energy Carolinas, Inc. Joint Operating Agreement.**¹³ On September 9, 2005, the FERC approved a JOA between PJM and Progress Energy Carolinas, Inc. (PEC), with an effective date of July 30, 2005. The agreement remained in effect through the first three months of 2010. As part of this agreement, both parties agreed to develop a formal CMP. On February 2, 2010, PJM and PEC filed a revision to the JOA to include a Congestion Management Protocol.¹⁴ The MMU responded to the filing on February 23, 2010.¹⁵ The MMU response noted that the agreement included discriminatory treatment for the identified transactions with respect to access to ATC, that a regional approach is preferable to entering into agreements with individual neighbors, and that a sunset should be required in order to ensure that the next step towards such regional coordination is taken without delay. PJM and PEC filed an answer on March 10, 2010, to which the MMU responded on April 2, 2010. PJM and PEC filed an additional answer on April 19, 2010.¹⁶ The matter currently is pending before the Commission.
- **PJM and Virginia and Carolinas Area (VACAR) South Reliability Coordination Agreement.**¹⁷ On May 23, 2007, PJM and VACAR South (VACAR is a sub-region within the NERC Southeastern Electric

Reliability Council (SERC) Region) entered into a reliability coordination agreement. It provides for system and outage coordination, emergency procedures and the exchange of data. Provisions are also made for regional studies and recommendations to improve the reliability of interconnected bulk power systems.

Other Agreements with Bordering Areas

- **Consolidated Edison Company of New York, Inc. (Con Edison) and Public Service Electric and Gas Company (PSE&G) Wheeling Contracts.** During the first three months of 2010, PJM continued to operate under the terms of the operating protocol developed in 2005.¹⁸ On February 23, 2009, PJM filed a settlement on behalf of the parties to subsequent proceedings to resolve remaining issues with these contracts and their proposed roll-over of the agreements under the PJM OATT.¹⁹ After NRG and FERC trial staff contested the settlement, the Commission found that the record does not sufficiently address “threshold issues” concerning the roll-over of these contracts, including the impact on locational marginal pricing, and whether this result would be unduly discriminatory.²⁰ The Commission has required the parties to brief these issues and has reserved the right to establish additional procedures if these briefs raise material issues of disputed fact.²¹

The MMU has reviewed the briefs filed in this proceeding on April 21, 2010, and believes that they raise questions about whether allowing roll over is appropriate.²² There is reason for concern that continuing these agreements may interfere with the efficient management of the NYISO/PJM seam, accord preferential access to transmission service and limit security constrained least cost dispatch. Moreover, no offsetting reliability consideration has been identified and explained. The MMU is reviewing the issues in this proceeding and may offer comments on the issues raised by the Commission in Docket No. ER08-858-000, et al. and in future reports.

¹¹ Complaint of PJM Interconnection, L.L.C., filed in EL10-60-000 at 19.

¹² See PJM, “Congestion Management Process (CMP) Master” (May 1, 2008) (Accessed April 22, 2010) <<http://www.pjm.com/documents/agreements/-/media/documents/agreements/20080502-miso-pjm-tva-baseline-cmp.ashx>> (432 KB).

¹³ See PJM, “Joint Operating Agreement (JOA) between Progress Energy Carolinas, Inc. and PJM” (July 29, 2005) (Accessed April 22, 2010) <<http://www.pjm.com/documents/agreements/-/media/documents/agreements/20081114-progress-pjm-joa.ashx>> (2,983 KB).

¹⁴ See PJM Interconnection, L.L.C and Progress Energy Carolinas, Inc. Docket No. ER10-713-000 (February 2, 2010).

¹⁵ See “Motion to Intervene and Comments of the Independent Market Monitor for PJM.” Docket No. ER10-713-000 (February 25, 2010) (Accessed April 21, 2010) <http://www.monitoringanalytics.com/reports/Reports/2010/IMM_Motion_to_Intervene_and_Comments_ER10-713-000_20100225.pdf> (225 KB).

¹⁶ Joint Motion for Leave to Answer and Answer of PJM Interconnection, L.L.C. and Progress Energy Carolinas, Inc.; Motion for Leave to Answer and Answer of the Independent Market Monitor for PJM; Joint Motion for Leave to Answer and Answer of PJM Interconnection, L.L.C. and Progress Energy Carolinas, Inc., in Docket No. ER10-713-000.

¹⁷ See PJM, “Adjacent Reliability Coordinator Coordination Agreement” (May 23, 2007) (Accessed April 22, 2010) <<http://www.pjm.com/documents/agreements/-/media/documents/agreements/executed-pjm-vacar-rc-agreement.ashx>> (528 KB).

¹⁸ 111 FERC ¶ 61,228 (2005).

¹⁹ See Docket Nos. ER08-858-000, ER08-867-000 and EL02-23-000. The settling parties are the New York Independent System Operator, Inc. (NYISO), Con Ed, PSE&G, PSE&G Energy Resources & Trading LLC and the New Jersey Board of Public Utilities.

²⁰ 130 FERC ¶ 61,126 at PP 1,24 (February 19, 2010) (“The parties need to address whether these contracts are sufficiently firm to be rolled over under Order No. 888; whether, if they are eligible for rollover, Con Ed is eligible only for OATT service, or whether the circumstances here warrant a non-conforming agreement; and whether and what effect these agreements have on the rights of and prices paid by other parties, including the effect of the flow changes in the JOA on the Locational Marginal Prices in both PJM and NYISO and the effect of these provisions on the ability of other parties to transact business.”).

²¹ *Id.*

²² See, e.g., Initial Brief in Response to Order Establishing Additional Procedures of the NRG Companies, filed in Docket No. ER08-858-000, et al.

- **Neptune Underwater Transmission Line to Long Island, New York.** On July 1, 2007, a 65-mile direct current (DC) transmission line from Sayreville, New Jersey, to Nassau County on Long Island, via undersea and underground cable, was placed in service, providing a direct connection from PJM to the New York Independent System Operator, Inc. (NYISO). This is a merchant 230 kV transmission line with a capacity of 660 MW. The line is bidirectional, but Schedule 14 of the PJM Open Access Transmission Tariff provides that power flows will only be from PJM to New York.²³ The basis for this limitation is unclear. Over the first three months of 2010, the PJM average hourly LMP at the Neptune Interface was \$48.63 while the NYISO LMP at the Neptune Bus was \$58.71, a difference of \$10.08. The average hourly flow during the first three months of 2010 was -621 MW, which aligned with price differentials in 61 percent of all hours during the first three months of 2010.
- **Linden Variable Frequency Transformer (VFT) Facility.** On November 1, 2009, the Linden VFT facility was placed in service, providing an additional direct connection from PJM to the NYISO. A variable frequency transformer allows for fast responding continuous bidirectional power flow control, similar to that of a phase angle regulating transformer.²⁴ The facility includes 350 feet of new 230 kV transmission line and 1,000 feet of new 345 kV transmission line, with a capacity of 300 MW. While the Linden VFT is a bidirectional facility, Schedule 16 of the PJM Open Access Transmission Tariff provides that power flows will only be from PJM to New York.²⁵ The basis for this limitation is unclear. Over the first three months of 2010, the PJM average hourly LMP at the Linden Interface was \$48.87 while the NYISO LMP at the Linden Bus was \$52.41, a difference of \$3.53. The average hourly flow during the first three months of 2010 was -176 MW, which aligned with price differentials in 51 percent of all hours during the first three months of 2010.

Interchange Transaction Issues

- **Loop Flows.** Loop flows are defined as the difference between actual and scheduled power flows at one or more specific interfaces. Loop flows arise from transactions on contract paths that do not

correspond to the actual physical paths that the energy takes. During the first three months of 2010, net scheduled interchange was -294 GWh and net actual interchange was -231 GWh for a difference of 63 GWh or 21.4 percent. While the three month net totals reflect a large mismatch between scheduled and actual interchange, an evaluation of the monthly net flows shows that the values have been converging. A similar pattern was observed in the first quarter of 2007, when the net scheduled interchange changed from net exports to net imports, reducing the net scheduled interchange, and increasing the net difference, resulting in a difference between scheduled and actual interchange of 49.4 percent. Loop flows are a significant concern because they have negative impacts on the efficiency of market areas with explicit locational pricing, including impacts on locational prices, on Financial Transmission Right (FTR) revenue adequacy and on system operations, and can be evidence of attempts to game such markets.

- **Loop Flows at the PJM/MECS and PJM/TVA Interfaces.** As it had in 2009, the PJM/Michigan Electric Coordinated System (MECS) Interface continued to exhibit large imbalances between scheduled and actual power flows (-3,964 GWh during the first three months of 2010 and -14,441 GWh during the calendar year 2009). The PJM/TVA Interface also exhibited large mismatches between scheduled and actual power flows (1,274 GWh during the first three months of 2010 and 3,840 GWh during the calendar year 2009). The net difference between scheduled flows and actual flows at the PJM/MECS Interface was exports while the net difference at the PJM/TVA Interface was imports.
- **Loop Flows at PJM's Southern Interfaces.** The difference between scheduled and actual power flows at PJM's southern interfaces (PJM/TVA and PJM/Eastern Kentucky Power Corporation (EKPC) to the west and PJM/eastern portion of Carolina Power & Light Company (CPLE), PJM/western portion of Carolina Power & Light Company (CPLW) and PJM/DUK to the east) was significant during the first three months of 2010.

The southern interfaces have historically experienced significant loop flows.²⁶ A portion of the historic loop flows were the result of the fact that the interface pricing points (Southeast and Southwest) allowed the opportunity for market participants to falsely arbitrage

²³ See PJM. "PJM Open Access Transmission Tariff" (October 15, 2009) (Accessed April 22, 2010) <<http://www.pjm.com/documents/-/media/documents/agreements/tariff.ashx>> (9,403 KB).

²⁴ A phase angle regulating transformer (PAR) allows dispatchers to change the flow of MW over a transmission line by changing the impedance of the transmission facility.

²⁵ See PJM. "PJM Open Access Transmission Tariff" (October 15, 2009) (Accessed April 22, 2010) <<http://www.pjm.com/documents/-/media/documents/agreements/tariff.ashx>> (9,884 KB).

²⁶ See 2002 *State of the Market Report*, Part 2, Section 3, "Interchange Transactions." (March 5, 2003) (Accessed April 22, 2010) <http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2002/SOM2002-part2.pdf> (4,068 KB).

- pricing differentials, creating a mismatch between actual and scheduled flows. On October 1, 2006, PJM modified the southern interface pricing points by creating a single import pricing point (SouthIMP) and a single export interface pricing point (SouthEXP). At the time of the consolidation of the Southeast and Southwest Interface pricing points, some market participants requested grandfathered treatment for specific transactions from PJM under which they would be allowed to keep the Southeast and Southwest Interface pricing. (The average difference between the Locational Marginal Price (LMP) at the Southeast pricing points and the SouthEXP pricing point was \$4.34 during the first three months of 2010 and the average difference between LMP at the Southwest pricing points and the SouthEXP pricing point was -\$3.05 during the first three months of 2010. In other words, it was more expensive to buy from PJM, for export to the south, using the old Southeast pricing point as opposed to the current SouthEXP pricing point, and less expensive to buy from PJM, for export to the south, using the old Southwest pricing point as opposed to the current SouthEXP pricing point.) These grandfathered agreements remain in place. The MMU recommends that these agreements be terminated, as the interface prices received for these agreements do not represent the economic fundamentals of locational marginal pricing. As an alternative, the agreements should be made public and the same terms should be made available to all qualifying entities.
- PJM Transmission Loading Relief Procedures (TLRs).** During the first three months of 2010, PJM issued 13 TLRs. Of the 13 TLRs issued, the highest levels reached were TLR 3a for seven events and TLR 3b for the remaining six events. TLRs are used to control congestion on the transmission system when it cannot be controlled via market forces. There are several factors that affect the number of times a reliability coordinator needs to initiate a TLR and the TLR level, including market design and operating agreements. The fact that PJM has issued only 13 TLRs during the first three months of 2010 reflects the ability to successfully control congestion through redispatch of generation including redispatch under the JOA with the Midwest ISO. PJM's operating rules allow PJM to reconfigure the transmission system prior to reaching system operating limits that would require the need for higher level TLRs.
 - Up-To Congestion.** In the period following the March 1, 2008 modifications to the up-to congestion bids (March 1, 2008 through March 31, 2010), the monthly average of up-to congestion bidding increased from 3,027.1 GWh (for the period from January 1, 2006 through April 30, 2008) to 4,620.3 GWh.

The up-to congestion transactions during the first three months of 2010 were comprised of 50.4 percent imports, 45.2 percent exports and 4.4 percent wheeling transactions. Only 0.4 percent of the up-to congestion transactions had matching Real-Time Market transactions. Of the up-to congestion transactions with matching Real-Time Market transactions, 0.1 percent were imports, 94.6 percent were exports and 5.3 percent were wheel through transactions.

When the up-to congestion product was used as intended, with matching Real-Time Market transactions, 80.8 percent of the total cleared transaction MW were profitable during the first three months of 2010. The net profit on all these transactions was approximately \$314,000. When up-to congestion transactions did not have a matching Real-Time Market transaction, 55.4 percent of the total cleared transaction MW were profitable. The net loss on all these transactions was approximately \$18.1 million.
 - Willing to Pay Congestion and Not Willing to Pay Congestion.** When reserving non-firm transmission, the market participant has the option to choose whether or not they are willing to pay congestion. When the market participant elects to pay congestion, PJM operators redispatch the system, if necessary, to allow the energy transaction to continue to flow.

If a market participant is not willing to pay congestion, it is the responsibility of the PJM operators to curtail their transaction as soon as there is a difference in LMPs between the source and sink associated with their transaction.

Uncollected congestion charges occur when PJM operators do not curtail a not willing to pay congestion transaction when there is congestion. The method that PJM uses to curtail not willing to pay congestion requires the transaction to be loaded. While loaded, if congestion occurs for a not willing to pay congestion transaction, a message is sent to the PJM operators requesting the transaction be curtailed at the next 15 minute interval.

The total uncollected congestion charges for the first three months of 2010 were \$978,756 (\$688,547 for the calendar year 2009). The MMU recommends modifying the evaluation criteria via a change to PJM's market software, to ensure that a not willing to pay congestion transaction is not permitted to flow in the presence of congestion.

Conclusion

Transactions between PJM and multiple balancing authorities in the Eastern Interconnection are part of a single energy market. While some of these balancing authorities are termed market areas and some are termed non market areas, all electricity transactions are part of a single energy market. Nonetheless, there are significant differences between market and non market areas. Market areas, like PJM, include essential features such as locational marginal pricing, financial hedging tools (FTRs and Auction Revenue Rights (ARRs) in PJM) and transparent, least cost, security constrained economic dispatch for all available generation. Non market areas do not include these features. The market areas are extremely transparent and the non market areas are not transparent.

The MMU analyzed the transactions between PJM and its neighboring balancing authorities for the first three months of 2010, including evolving transaction patterns, economics and issues. During the first three months of 2010, PJM was a net exporter of energy and a large share of both import and export activity occurred at a small number of interfaces. Three interfaces accounted for 73 percent of the total real-time net exports and two interfaces accounted for 78 percent of the real-time net import volume. Four interfaces accounted for 84 percent of the total day-ahead net exports and two interfaces accounted for 89 percent of the day-ahead net import volume.

Interchange Transaction Activity

Aggregate Imports and Exports

Figure 4-1 PJM real-time scheduled imports and exports: January through March 2010 (See 2009 SOM, Figure 4-1)

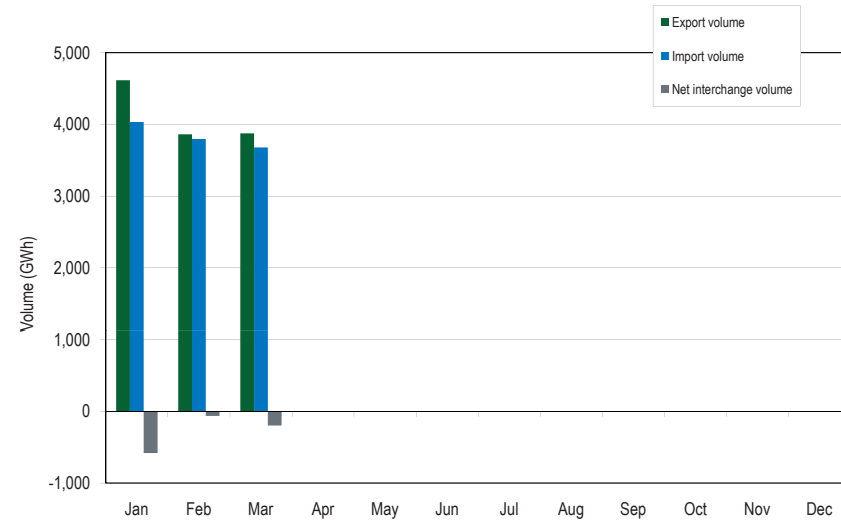


Figure 4-2 PJM day-ahead scheduled imports and exports: January through March 2010 (See 2009 SOM, Figure 4-2)

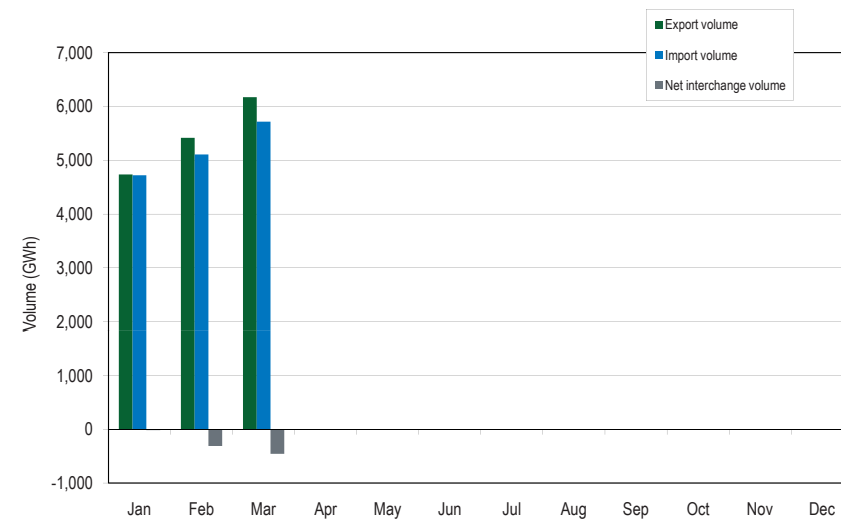
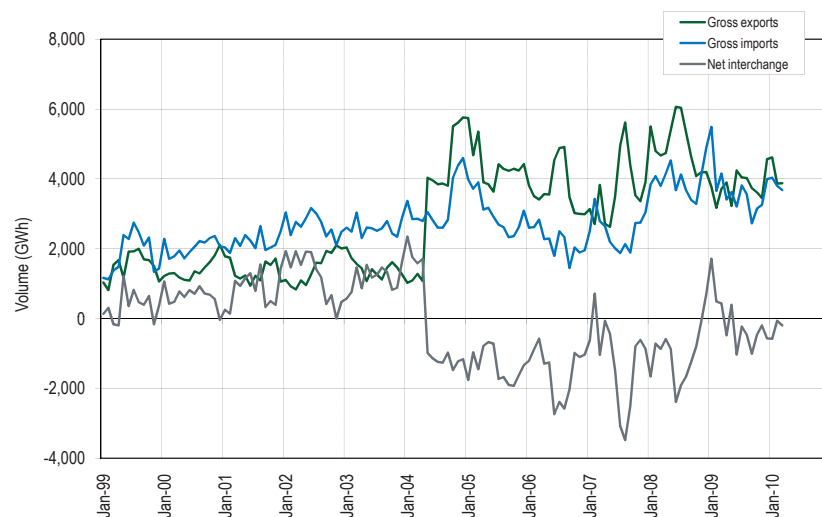


Figure 4-3 PJM scheduled import and export transaction volume history: 1999 through March 2010 (See 2009 SOM, Figure 4-3)



Interface Imports and Exports

Table 4-1 Real-time scheduled net interchange volume by interface (GWh): January through March 2010 (See 2009 SOM, Table 4-1)

	Jan	Feb	Mar	Total
CPLE	(70.4)	(72.8)	(40.8)	(184.0)
CPLW	0.0	0.0	0.0	0.0
DUK	219.7	92.2	(32.8)	279.1
EKPC	(65.5)	(99.2)	14.1	(150.6)
LGEE	31.9	144.5	29.7	206.1
MEC	(454.2)	(422.0)	(458.1)	(1,334.3)
MISO	(74.1)	512.4	510.7	949.0
ALTE	3.6	(9.5)	13.7	7.8
ALTW	(32.1)	(8.4)	1.4	(39.1)
AMIL	(141.6)	(85.5)	(63.5)	(290.6)
CIN	78.4	323.4	233.5	635.3
CWLP	0.0	0.0	0.0	0.0
FE	(117.4)	(60.2)	(70.6)	(248.2)
IPL	(28.4)	48.4	(4.6)	15.4
MECS	195.1	312.7	387.5	895.3
NIPS	(24.0)	(10.8)	(4.9)	(39.7)
WEC	(7.7)	2.3	18.2	12.8
NYISO	(1,307.0)	(1,039.9)	(1,109.6)	(3,456.5)
LIND	(146.0)	(125.5)	(115.7)	(387.2)
NEPT	(496.7)	(423.6)	(449.9)	(1,370.2)
NYIS	(664.3)	(490.8)	(544.0)	(1,699.1)
OVEC	1,176.9	943.0	1,018.8	3,138.7
TVA	(39.0)	(121.5)	(129.3)	(289.8)
Total	(581.7)	(63.3)	(197.3)	(842.3)

Table 4-2 Real-time scheduled gross import volume by interface (GWh): January through March 2010 (See 2009 SOM, Table 4-2)

	Jan	Feb	Mar	Total
CPLE	128.3	113.4	99.8	341.5
CPLW	0.0	0.0	0.0	0.0
DUK	408.5	235.2	135.1	778.8
EKPC	15.8	3.0	53.9	72.7
LGEE	48.9	150.5	73.5	272.9
MEC	44.1	28.1	35.7	107.9
MISO	1,142.9	1,388.4	1,292.1	3,823.4
ALTE	30.0	8.0	28.9	66.9
ALTW	0.0	5.4	7.6	13.0
AMIL	23.5	49.2	39.2	111.9
CIN	500.9	555.4	454.8	1,511.1
CWLP	0.0	0.0	0.0	0.0
FE	181.6	207.6	205.4	594.6
IPL	47.1	116.7	16.2	180.0
MECS	304.3	385.9	475.1	1,165.3
NIPS	0.0	0.0	0.0	0.0
WEC	55.5	60.2	64.9	180.6
NYISO	934.4	901.2	922.5	2,758.1
LIND	0.0	0.0	0.0	0.0
NEPT	0.0	0.0	0.0	0.0
NYIS	934.4	901.2	922.5	2,758.1
OVEC	1,176.9	943.0	1,018.8	3,138.7
TVA	134.6	35.7	47.7	218.0
Total	4,034.4	3,798.5	3,679.1	11,512.0

Table 4-3 Real-time scheduled gross export volume by interface (GWh): January through March 2010 (See 2009 SOM, Table 4-3)

	Jan	Feb	Mar	Total
CPLE	198.7	186.2	140.6	525.5
CPLW	0.0	0.0	0.0	0.0
DUK	188.8	143.0	167.9	499.7
EKPC	81.3	102.2	39.8	223.3
LGEE	17.0	6.0	43.8	66.8
MEC	498.3	450.1	493.8	1,442.2
MISO	1,217.0	876.0	781.4	2,874.4
ALTE	26.4	17.5	15.2	59.1
ALTW	32.1	13.8	6.2	52.1
AMIL	165.1	134.7	102.7	402.5
CIN	422.5	232.0	221.3	875.8
CWLP	0.0	0.0	0.0	0.0
FE	299.0	267.8	276.0	842.8
IPL	75.5	68.3	20.8	164.6
MECS	109.2	73.2	87.6	270.0
NIPS	24.0	10.8	4.9	39.7
WEC	63.2	57.9	46.7	167.8
NYISO	2,241.4	1,941.1	2,032.1	6,214.6
LIND	146.0	125.5	115.7	387.2
NEPT	496.7	423.6	449.9	1,370.2
NYIS	1,598.7	1,392.0	1,466.5	4,457.2
OVEC	0.0	0.0	0.0	0.0
TVA	173.6	157.2	177.0	507.8
Total	4,616.1	3,861.8	3,876.4	12,354.3

Table 4-4 Day-ahead net interchange volume by interface (GWh): January through March 2010
(See 2009 SOM, Table 4-4)

	Jan	Feb	Mar	Total
CPLE	(89.3)	(111.3)	(114.7)	(315.3)
CPLW	10.2	(1.0)	1.0	10.2
DUK	161.4	38.4	8.6	(214.4)
EKPC	(1.5)	(5.9)	(3.4)	(60.1)
LGEE	1.0	5.3	0.0	(33.2)
MEC	(479.4)	(444.1)	(482.8)	(3,374.0)
MISO	282.3	(160.5)	(312.1)	(190.3)
ALTE	227.6	(257.5)	(136.2)	(166.1)
ALTW	(282.2)	(414.3)	(1,220.9)	(1,917.4)
AMIL	14.4	97.5	6.7	118.6
CIN	182.9	(60.8)	43.1	165.2
CWLP	0.0	0.0	0.0	0.0
FE	(70.5)	(20.7)	118.8	27.6
IPL	(53.4)	(18.4)	(44.7)	(116.5)
MECS	387.8	654.4	885.6	1,927.8
NIPS	(204.5)	(217.0)	(143.3)	(564.8)
WEC	80.2	76.3	178.8	335.3
NYISO	(969.0)	(912.0)	(825.4)	(2,706.4)
LIND	(21.1)	(18.3)	(53.2)	(92.6)
NEPT	(502.6)	(445.2)	(456.7)	(1,404.5)
NYIS	(445.3)	(448.5)	(315.5)	(1,209.3)
OVEC	1,074.0	1,243.3	1,300.5	3,617.8
TVA	(5.3)	37.8	(27.0)	5.5
Total	(15.6)	(310.0)	(455.3)	(780.9)

Table 4-5 Day-ahead gross import volume by interface (GWh): January through March 2010
(See 2009 SOM, Table 4-5)

	Jan	Feb	Mar	Total
CPLE	64.2	39.5	29.3	133.0
CPLW	15.6	0.6	1.8	18.0
DUK	176.3	96.2	48.1	320.6
EKPC	0.0	0.0	0.4	0.4
LGEE	1.0	5.4	0.0	6.4
MEC	18.8	5.6	12.2	36.6
MISO	2,400.5	2,738.3	3,112.5	8,251.3
ALTE	866.4	762.4	662.8	2,291.6
ALTW	72.0	67.2	72.4	211.6
AMIL	68.1	157.9	50.5	276.5
CIN	436.8	592.0	555.1	1,583.9
CWLP	0.0	0.0	0.0	0.0
FE	156.2	176.9	364.9	698.0
IPL	26.9	29.4	30.7	87.0
MECS	606.2	801.7	1,125.2	2,533.1
NIPS	28.6	19.5	24.3	72.4
WEC	139.3	131.3	226.6	497.2
NYISO	835.3	885.1	1,095.7	2,816.1
LIND	0.0	0.0	0.0	0.0
NEPT	0.0	0.0	0.0	0.0
NYIS	835.3	885.1	1,095.7	2,816.1
OVEC	1,133.2	1,259.7	1,379.9	3,772.8
TVA	75.9	77.8	36.7	190.4
Total	4,720.8	5,108.2	5,716.6	15,545.6

Table 4-6 Day-ahead gross export volume by interface (GWh): January through March 2010
(See 2009 SOM, Table 4-6)

	Jan	Feb	Mar	Total
CPLC	153.5	150.8	144.0	448.3
CPLW	5.4	1.6	0.8	7.8
DUK	14.9	57.8	39.5	535.0
EKPC	1.5	5.9	3.8	60.5
LGEE	0.0	0.1	0.0	39.6
MEC	498.2	449.7	495.0	3,410.6
MISO	2,118.2	2,898.8	3,424.6	8,441.6
ALTE	638.8	1,019.9	799.0	2,457.7
ALTW	354.2	481.5	1,293.3	2,129.0
AMIL	53.7	60.4	43.8	157.9
CIN	253.9	652.8	512.0	1,418.7
CWLP	0.0	0.0	0.0	0.0
FE	226.7	197.6	246.1	670.4
IPL	80.3	47.8	75.4	203.5
MECS	218.4	147.3	239.6	605.3
NIPS	233.1	236.5	167.6	637.2
WEC	59.1	55.0	47.8	161.9
NYISO	1,804.3	1,797.1	1,921.1	5,522.5
LIND	21.1	18.3	53.2	92.6
NEPT	502.6	445.2	456.7	1,404.5
NYIS	1,280.6	1,333.6	1,411.2	4,025.4
OVEC	59.2	16.4	79.4	155.0
TVA	81.2	40.0	63.7	184.9
Total	4,736.4	5,418.2	6,171.9	16,326.5

Interface Pricing

Table 4-7 Active interfaces: January through March 2010 (See 2009 SOM, Table 4-7)

	Jan	Feb	Mar
ALTE	Active	Active	Active
ALTW	Active	Active	Active
AMIL	Active	Active	Active
CIN	Active	Active	Active
CPLC	Active	Active	Active
CPLW	Active	Active	Active
CWLP	Active	Active	Active
DUK	Active	Active	Active
EKPC	Active	Active	Active
FE	Active	Active	Active
IPL	Active	Active	Active
LGEE	Active	Active	Active
LIND	Active	Active	Active
MEC	Active	Active	Active
MECS	Active	Active	Active
NEPT	Active	Active	Active
NIPS	Active	Active	Active
NYIS	Active	Active	Active
OVEC	Active	Active	Active
TVA	Active	Active	Active
WEC	Active	Active	Active

Figure 4-4 PJM's footprint and its external interfaces (See 2009 SOM, Figure 4-4)

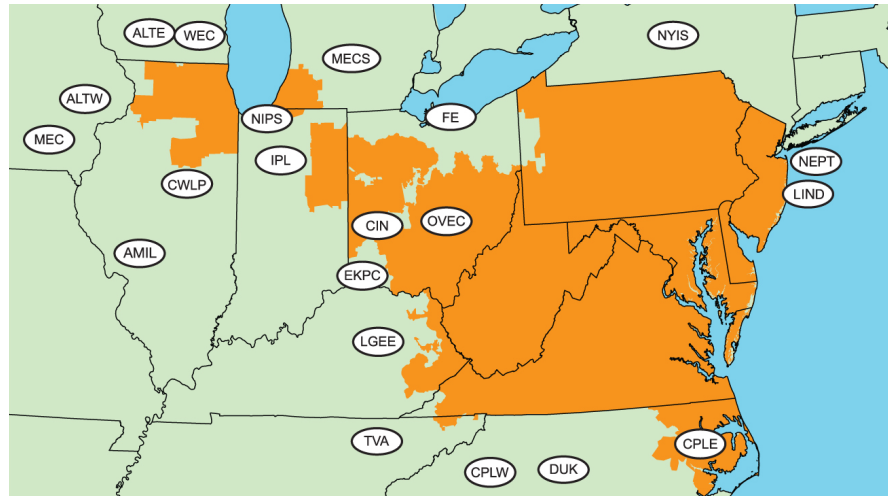


Table 4-8 Active pricing points: January through March 2010 (See 2009 SOM, Table 4-8)

PJM 2010 Pricing Points (January through March)			
LIND	MICHFE	MISO	NEPT
NIPSCO	Northwest	NYIS	Ontario IESO
OVEC	SOUTHEXP	SOUTHIMP	

Interactions with Bordering Areas

PJM Interface Pricing with Organized Markets

PJM and Midwest ISO Interface Prices

Figure 4-5 Real-time daily hourly average price difference (Midwest ISO Interface minus PJM/MISO): January through March 2010 (See 2009 SOM, Figure 4-5)

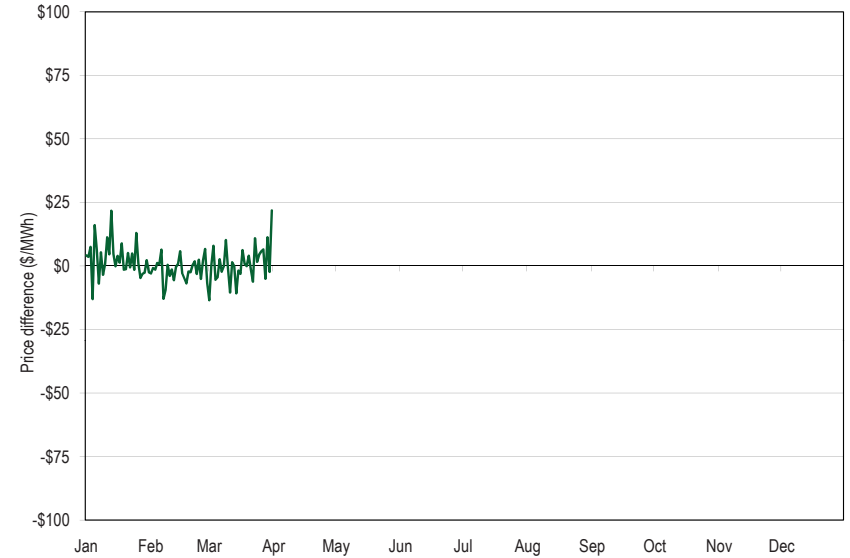


Figure 4-6 Real-time monthly hourly average Midwest ISO PJM interface price and the PJM/MISO price: April 2005 through March 2010 (See 2009 SOM, Figure 4-6)

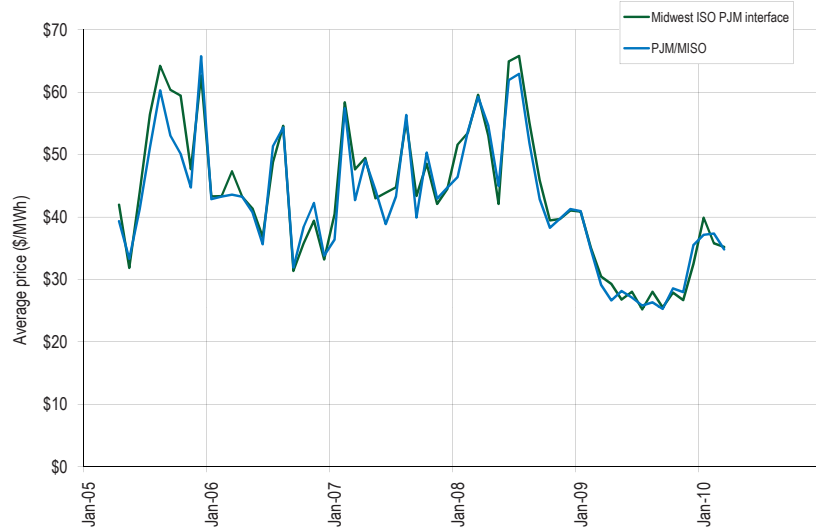


Figure 4-7 Day-ahead daily hourly average price difference (Midwest ISO interface minus PJM/MISO): January through March 2010 (See 2009 SOM, Table 4-7)

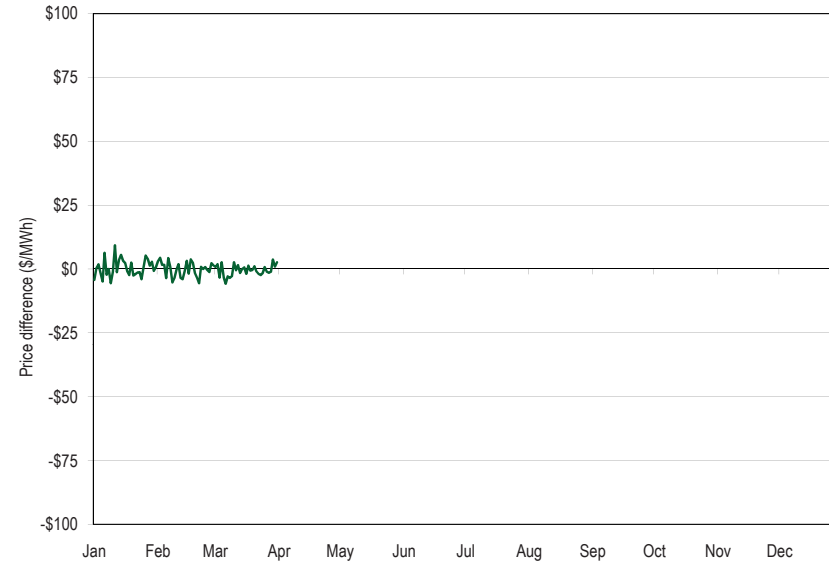
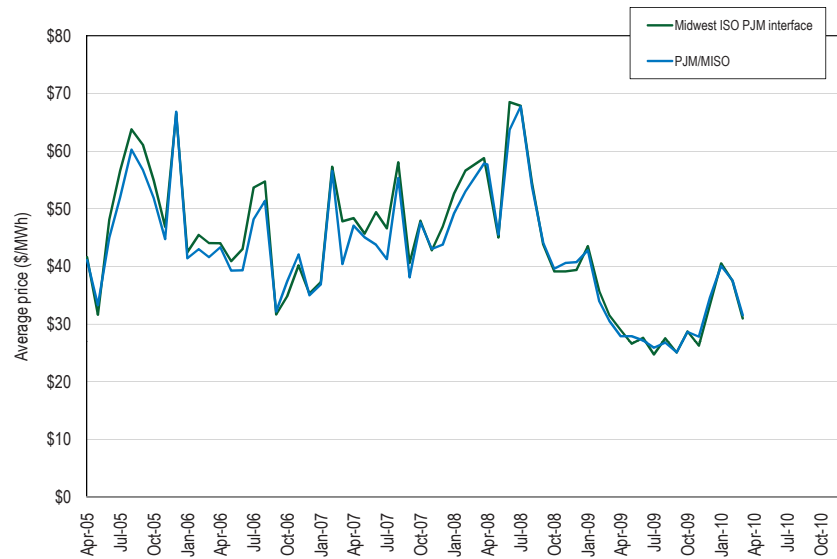


Table 4-9 Average real-time LMP difference (PJM minus Midwest ISO): January 1, 2008 through March 31, 2010 (See 2009 SOM, Table 4-9)

	2008			2009			2010		
	LMP	MCC	MLC	LMP	MCC	MLC	LMP	MCC	MLC
Kincaid (PJM) & Coffeen (MISO)	\$8.26	(\$6.56)	(\$2.86)	\$4.81	(\$2.65)	(\$2.06)	\$2.41	(\$4.85)	(\$2.85)
Beaver Valley (PJM) & Mansfield (MISO)	\$0.89	(\$14.42)	(\$2.38)	\$3.22	(\$4.92)	(\$1.38)	\$1.50	(\$6.67)	(\$1.95)
Miami Fort (PJM) & (MISO)	\$1.25	(\$12.27)	(\$4.16)	\$2.20	(\$4.64)	(\$2.70)	\$1.93	(\$4.67)	(\$3.51)
Stuart (PJM) & (MISO)	\$0.87	(\$12.04)	(\$4.77)	\$1.81	(\$4.63)	(\$3.07)	\$1.49	(\$4.70)	(\$3.92)
PJM/MISO Interface	(\$1.16)	(\$15.34)	(\$3.51)	\$0.01	(\$6.94)	(\$2.58)	(\$0.38)	(\$7.07)	(\$3.42)

LMP: Locational Marginal Price, MCC: Marginal Congestion Component, MLC: Marginal Loss Component

Figure 4-8 Day-ahead monthly hourly average Midwest ISO PJM interface price and the PJM/MISO price: April 2005 through March 2010 (See 2009 SOM, Table 4-8)



PJM and NYISO Interface Prices

Figure 4-9 Real-time daily hourly average price difference (NY proxy - PJM/NYIS): January through March 2010 (See 2009 SOM, Figure 4-9)

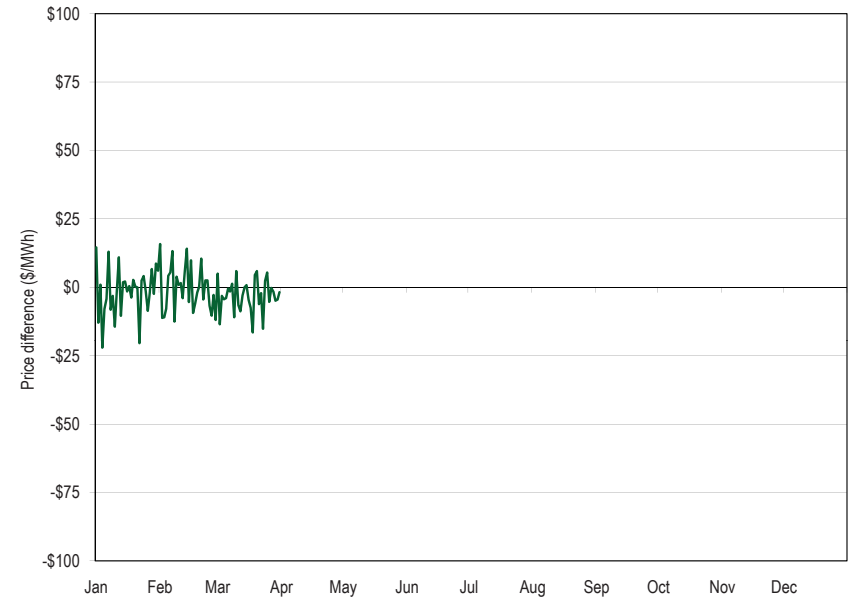


Table 4-10 Average day-ahead LMP difference (PJM minus Midwest ISO): January 1, 2008 through March 31, 2010 (See 2009 SOM, Table 4-10)

	2008			2009			2010		
	LMP	MCC	MLC	LMP	MCC	MLC	LMP	MCC	MLC
Kincaid (PJM) & Coffeen (MISO)	\$9.19	(\$3.00)	(\$4.25)	\$4.02	(\$2.06)	(\$2.80)	\$1.41	(\$5.77)	(\$3.28)
Beaver Valley (PJM) & Mansfield (MISO)	\$3.40	(\$9.88)	(\$3.16)	\$2.48	(\$4.72)	(\$1.67)	\$1.33	(\$6.90)	(\$2.24)
Miami Fort (PJM) & (MISO)	(\$0.05)	(\$11.17)	(\$5.32)	\$1.87	(\$3.85)	(\$3.16)	\$1.15	(\$5.05)	(\$4.26)
Stuart (PJM) & (MISO)	(\$0.56)	(\$11.00)	(\$6.00)	\$1.40	(\$3.87)	(\$3.61)	\$0.58	(\$5.07)	(\$4.81)
PJM/MISO Interface	(\$0.62)	(\$12.51)	(\$4.55)	(\$0.03)	(\$5.75)	(\$3.16)	\$0.07	(\$6.25)	(\$4.14)

LMP: Locational Marginal Price, MCC: Marginal Congestion Component, MLC: Marginal Loss Component

Figure 4-10 Real-time monthly hourly average NYISO/PJM proxy bus price and the PJM/NYIS price: January 2002 through March 2010 (See 2009 SOM, Figure 4-10)

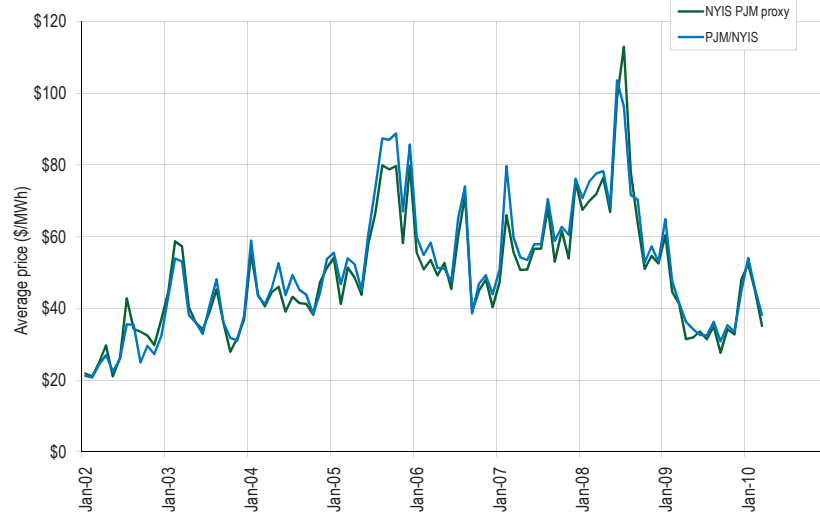


Figure 4-11 Day-ahead daily hourly average price difference (NY proxy - PJM/NYIS): January through March 2010 (See 2009 SOM, Table 4-11)

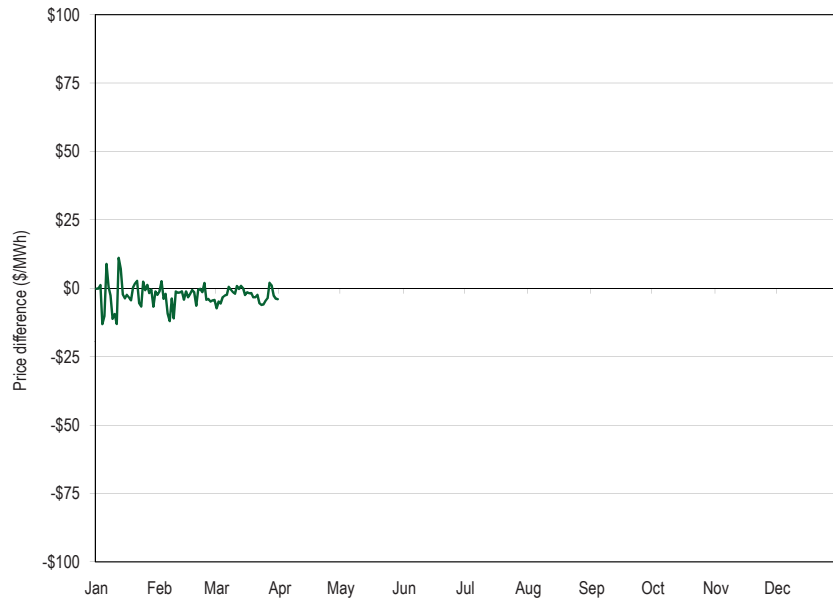
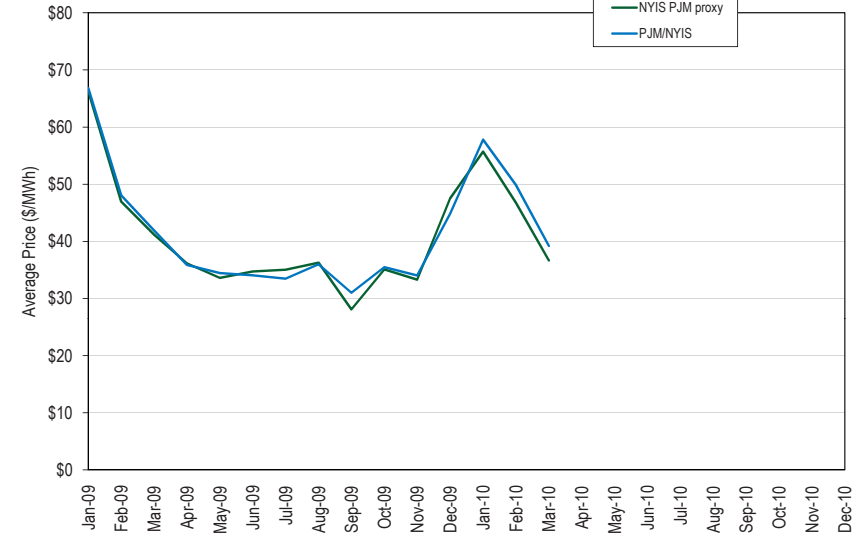


Figure 4-12 Day-ahead monthly hourly average NYISO/PJM proxy bus price and the PJM/NYIS price: January 2009 through March 2010 (See 2009 SOM, Figure 4-12)



Summary of Interface Prices between PJM and Organized Markets

Figure 4-13 PJM, NYISO and Midwest ISO real-time border price averages: January through March 2010 (See 2009 SOM, Figure 4-13)

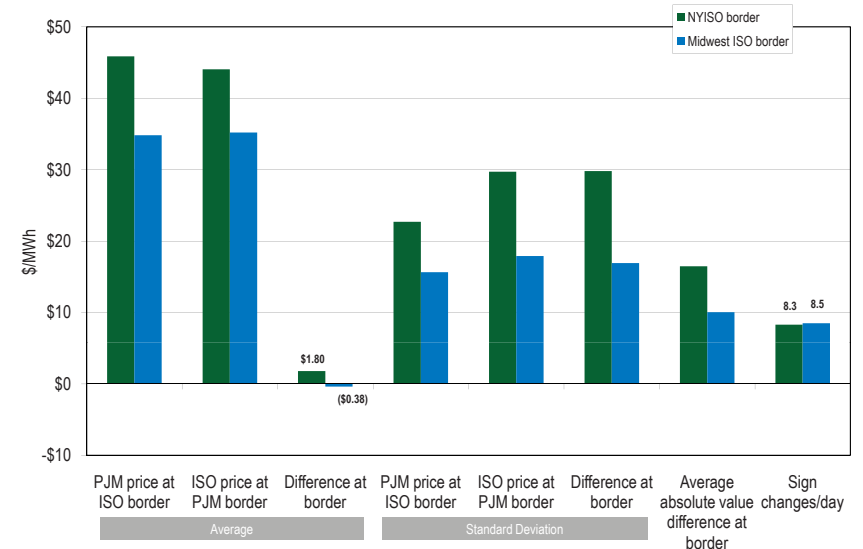
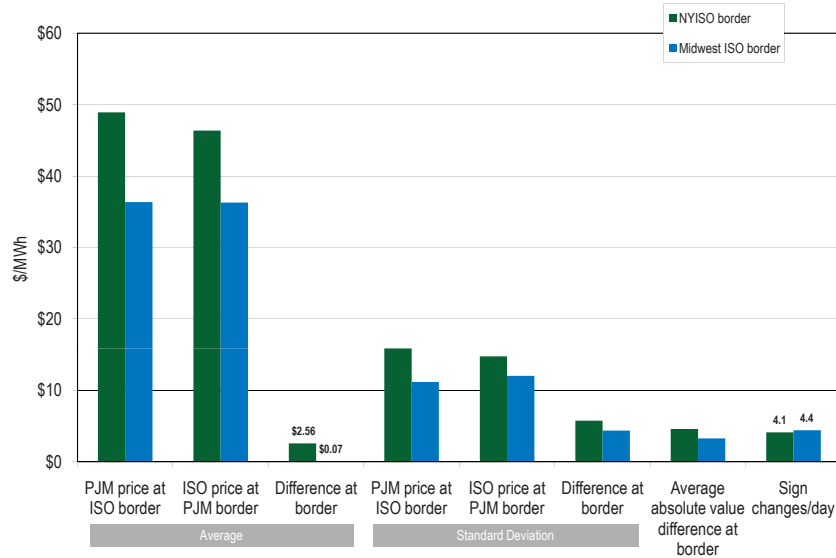


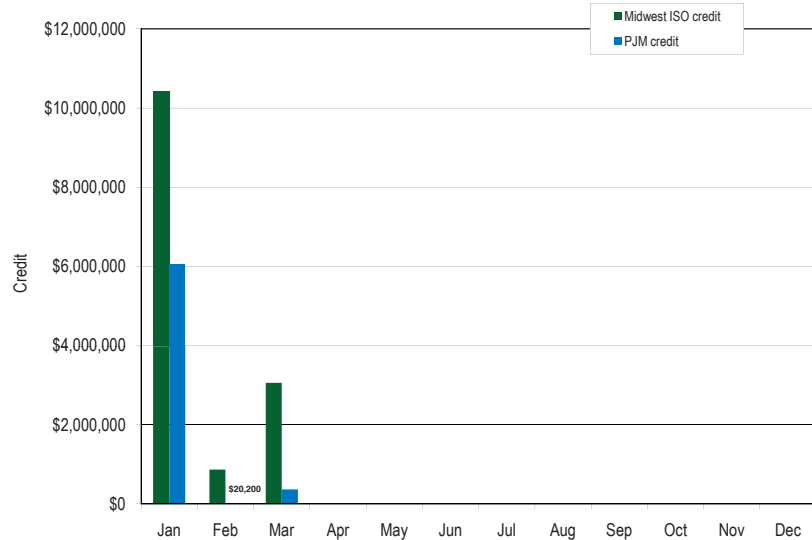
Figure 4-14 PJM, NYISO and Midwest ISO day-ahead border price averages: January through March 2010 (See 2009 SOM, Figure 4-14)



Operating Agreements with Bordering Areas

PJM and Midwest ISO Joint Operating Agreement

Figure 4-15 Credits for coordinated congestion management: January through March 2010 (See 2009 SOM, Figure 4-15)



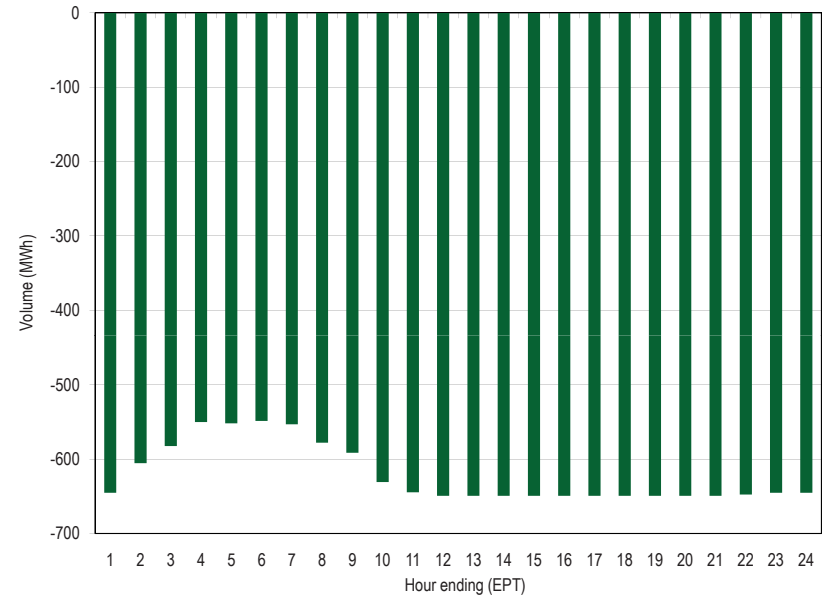
Con Edison and PSE&G Wheeling Contracts

Table 4-11 Con Edison and PSE&G wheeling settlement data: January through March 2010 (See 2009 SOM, Table 4-11)

	Con Edison			PSE&G		
	Day Ahead	Balancing	Total	Day Ahead	Balancing	Total
Total Congestion Credit	\$1,760,260	(\$26,446)	\$1,733,814	\$2,664,348	\$0	\$2,664,348
Congestion Credit			\$1,333,227			\$2,519,586
Adjustments			\$0			(\$971)
Net Charge			\$400,588			\$145,732

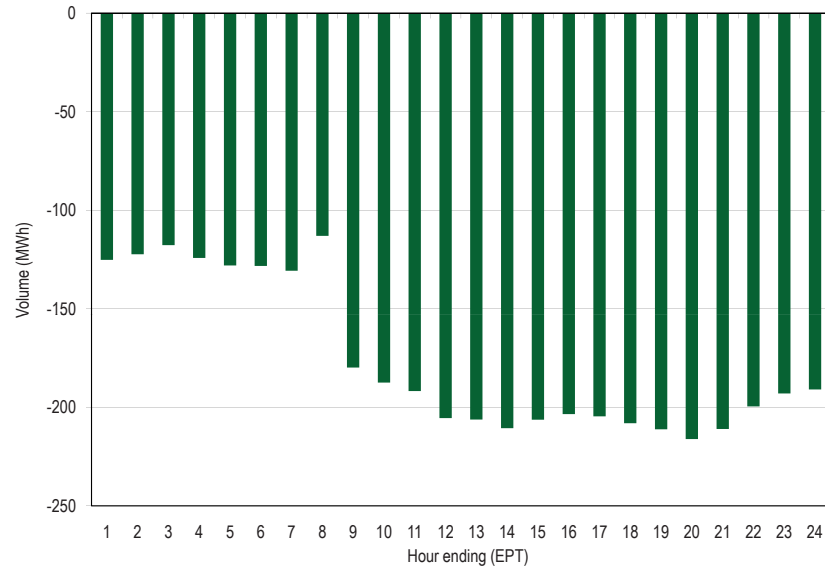
Neptune Underwater Transmission Line to Long Island, New York

Figure 4-16 Neptune hourly average flow: January through March 2010 (See 2009 SOM, Figure 4-16)



Linden Variable Frequency Transformer (VFT) facility

Figure 4-17 Linden hourly average flow: January through March 2010 (See 2009 SOM, Figure 4-17)



Interchange Transaction Issues

Loop Flows

Table 4-12 Net scheduled and actual PJM interface flows (GWh): January through March 2010 (See 2009 SOM, Table 4-12)

	Actual	Net Scheduled	Difference (GWh)	Difference (percent of net scheduled)
CPLE	2,552	98	2,454	2504%
CPLW	(472)	-	(472)	0%
DUK	(586)	279	(865)	(310%)
EKPC	48	(151)	199	(132%)
LGEE	353	206	147	71%
MEC	(773)	(1,333)	560	(42%)
MISO	(2,264)	1,229	(3,493)	(284%)
ALTE	(1,527)	8	(1,535)	(19188%)
ALTW	(561)	(39)	(522)	1338%
AMIL	1,153	(315)	1,468	(466%)
CIN	1,088	1,237	(149)	(12%)
CWLP	(25)	-	(25)	0%
FE	(455)	(545)	90	(17%)
IPL	716	15	701	4673%
MECS	(3,069)	895	(3,964)	(443%)
NIPS	(550)	(40)	(510)	1275%
WEC	966	13	953	7331%
NYISO	(2,269)	(3,471)	1,202	(35%)
LIND	(379)	(379)	-	0%
NEPT	(1,342)	(1,342)	-	0%
NYIS	(548)	(1,750)	1,202	(69%)
OVEC	2,196	3,139	(943)	(30%)
TVA	984	(290)	1,274	(439%)
Total	(231)	(294)	63	(21.4%)

Loop Flows at PJM's Southern Interfaces

Figure 4-18 Southwest actual and scheduled flows: January 2006 through March 2010 (See 2009 SOM, Figure 4-18)

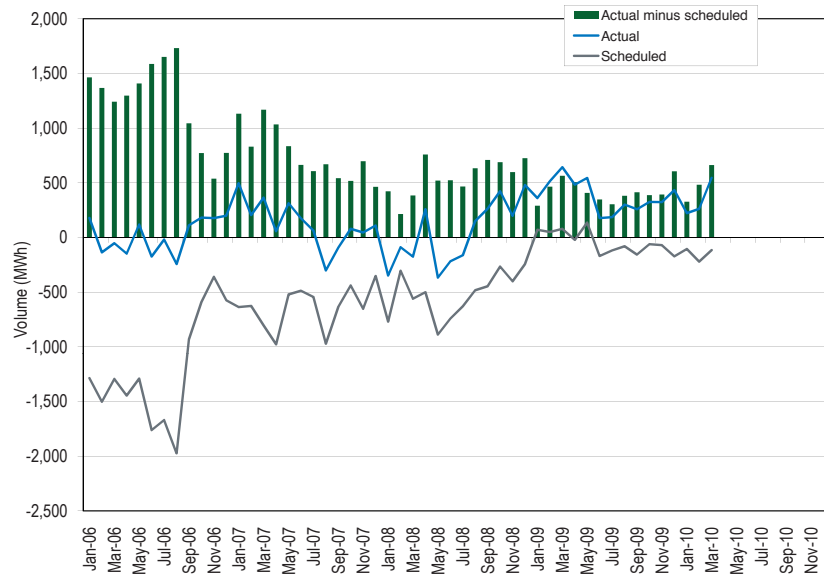
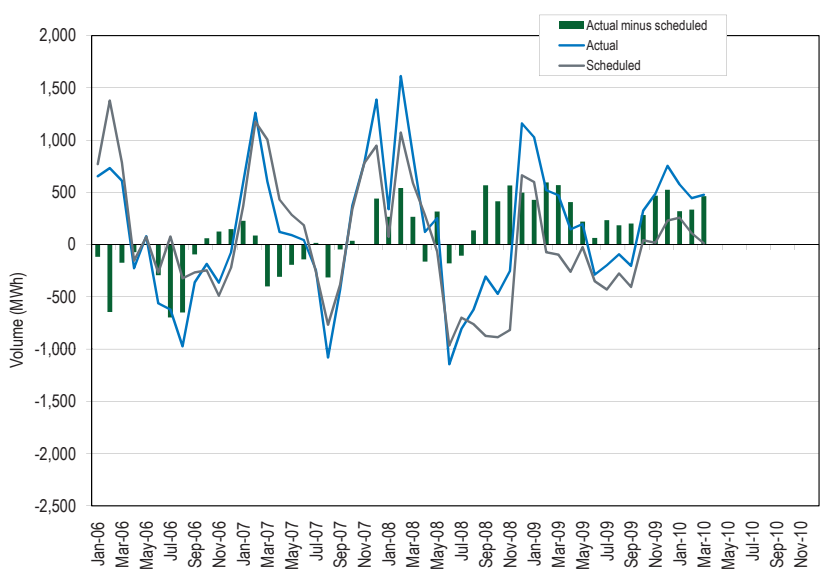


Figure 4-19 Southeast actual and scheduled flows: January 2006 through March 2010 (See 2009 SOM, Figure 4-19)



TLRs

Figure 4-20 PJM and Midwest ISO TLR procedures: Calendar year 2009 and January through March 2010 (See 2009 SOM, Figure 4-20)

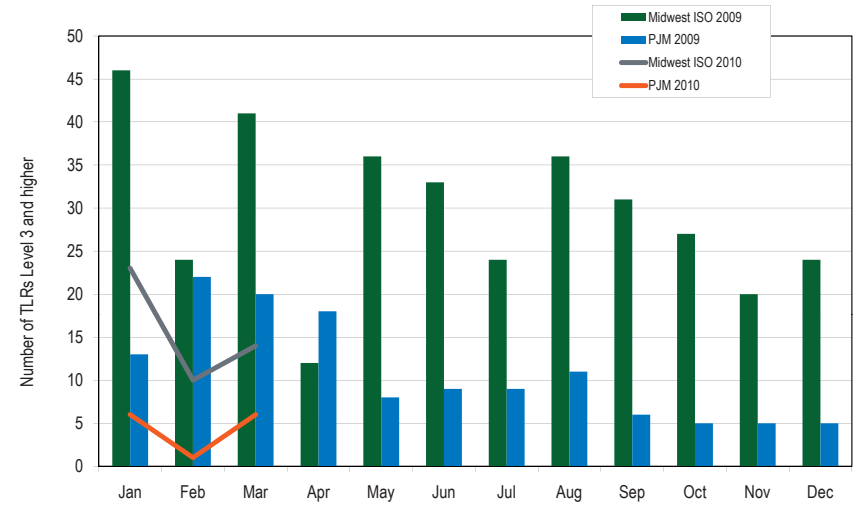


Figure 4-21 Number of different PJM flowgates that experienced TLRs: Calendar year 2009 and January through March 2010 (See 2009 SOM, Figure 4-21)

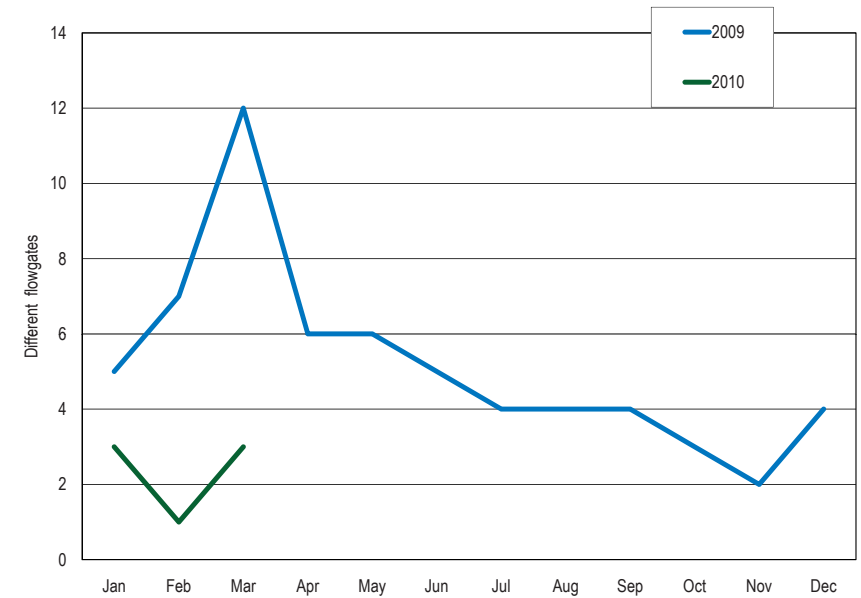


Figure 4-22 Number of PJM TLRs and curtailed volume: January through March 2010 (See 2009, Figure 4-22)

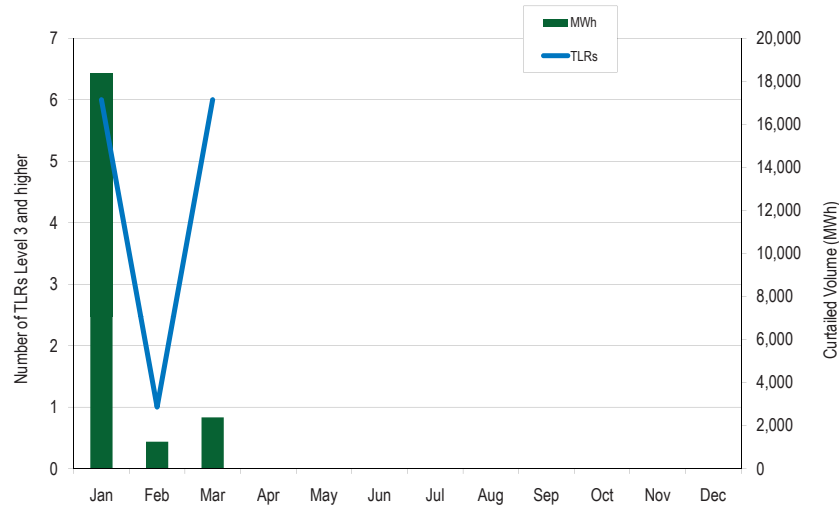


Table 4-13 Number of TLRs by TLR level by reliability coordinator: January through March 2010 (See 2009 SOM, Table 4-13)

Year	Reliability Coordinator	3a	3b	4	5a	5b	6	Total
2010	ICTE	11	4	20	2	0	0	37
	MISO	32	12	0	4	2	0	50
	NYIS	60	0	0	0	0	0	60
	ONT	18	1	0	0	0	0	19
	PJM	7	6	0	0	0	0	13
	SWPP	47	287	6	9	7	0	356
	TVA	2	4	0	0	0	0	6
	Total	177	314	26	15	9	0	541

Up-To Congestion

Figure 4-23 Monthly up-to congestion bids in MWh: January 2006 through March 2010 (See 2009 SOM, Figure 4-23)

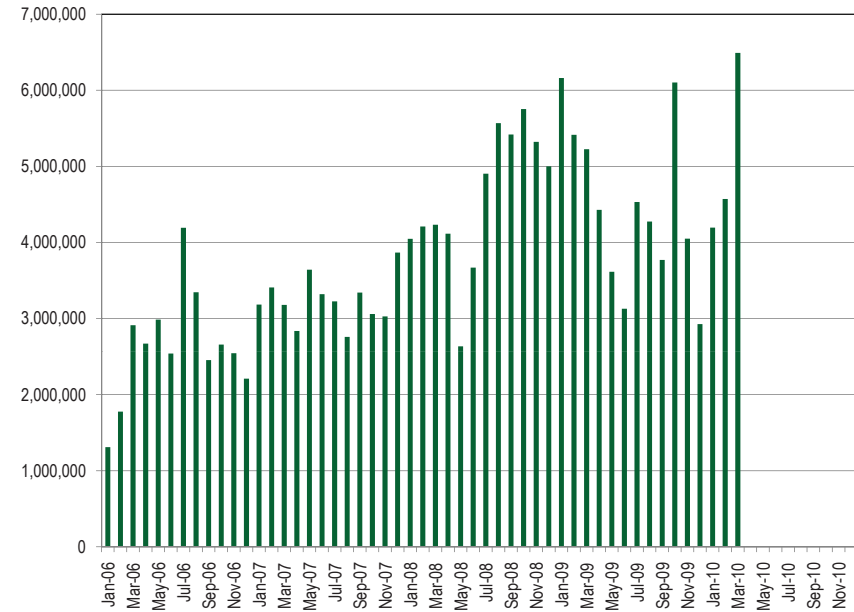


Table 4-14 Up-to congestion MW by Import, Export and Wheels: January 2006 through March 2010 (See 2009 SOM, Table 4-14)

	Import MW	Export MW	Wheeling MW	Total MW	Percent Imports	Percent Exports	Percent Wheels
2006	10,730,659	20,398,833	468,648	31,598,141	34.0%	64.6%	1.5%
2007	13,950,514	24,080,803	817,237	38,848,554	35.9%	62.0%	2.1%
2008	20,889,972	32,351,960	1,632,874	54,874,806	38.1%	59.0%	3.0%
2009	24,455,358	27,722,740	1,453,553	53,631,651	45.6%	51.7%	2.7%
2010	7,696,350	6,895,256	666,001	15,257,607	50.4%	45.2%	4.4%
TOTAL	77,722,854	111,449,592	5,038,312	194,210,758	40.0%	57.4%	2.6%

Figure 4-24 Total settlements showing positive, negative and net gains for up-to congestion bids with a matching Real-Time Market transaction: January through March 2010 (See 2009 SOM, Figure 4-24)

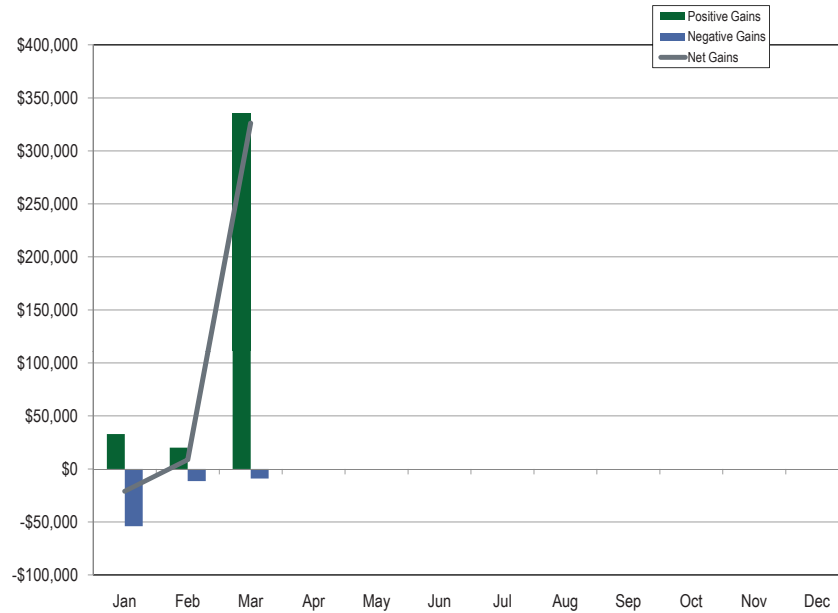
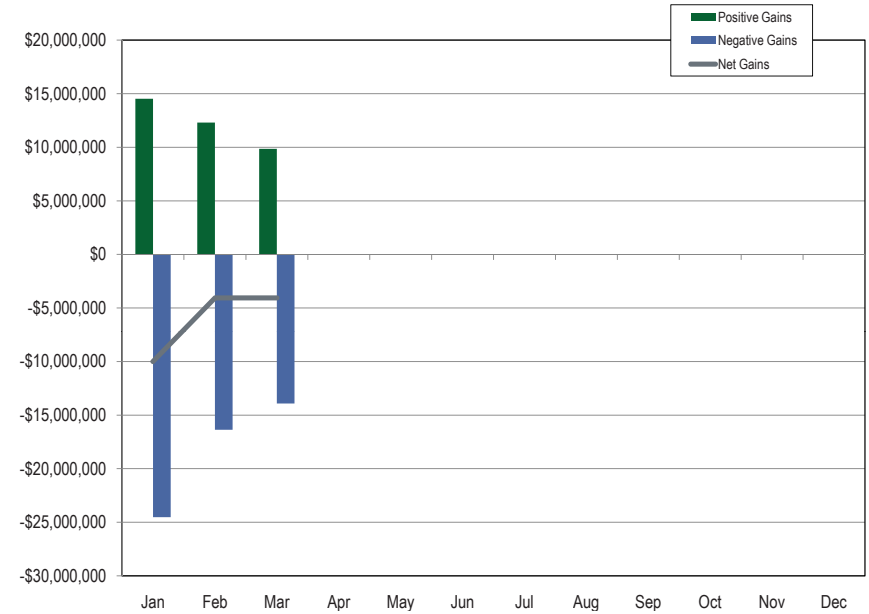


Figure 4-25 Total settlements showing positive, negative and net gains for up-to congestion bids without a matching Real-Time Market transaction: January through March 2010 (See 2009 SOM, Figure 4-25)



Interface Pricing Agreements with Individual Companies

Table 4-15 Real-time average hourly LMP comparison for southeast, southwest, SouthIMP and SouthEXP Interface pricing points: November 1, 2006 through March 2010 (See 2009 SOM, Table 4-15)

	southeast LMP	southwest LMP	SOUTHIMP LMP	SOUTHEXP LMP	Difference southeast LMP - SOUTHIMP	Difference southwest LMP - SOUTHIMP	Difference southeast LMP - SOUTHEXP	Difference southwest LMP - SOUTHEXP
2006	\$42.55	\$37.89	\$38.36	\$42.02	\$4.20	(\$0.47)	\$0.53	(\$4.13)
2007	\$54.35	\$45.48	\$49.09	\$48.48	\$5.26	(\$3.61)	\$5.87	(\$3.01)
2008	\$62.97	\$51.43	\$55.47	\$55.44	\$7.50	(\$4.05)	\$7.53	(\$4.01)
2009	\$35.97	\$31.94	\$33.37	\$33.37	\$2.61	(\$1.42)	\$2.61	(\$1.42)
2010	\$44.59	\$37.20	\$40.25	\$40.25	\$4.34	(\$3.05)	\$4.34	(\$3.05)

Table 4-16 Real-time average hourly LMP comparison for Duke, PEC and NCMPA: January through March 2010 (See 2009 SOM, Table 4-17)

	IMPORT LMP	EXPORT LMP	SOUTHIMP	SOUTHEXP	Difference IMP LMP - SOUTHIMP	Difference EXP LMP - SOUTHEXP
Duke	\$43.30	\$43.94	\$40.25	\$40.25	\$3.05	\$3.69
PEC	\$43.61	\$45.60	\$40.25	\$40.25	\$3.37	\$5.35
NCMPA	\$43.55	\$43.66	\$40.25	\$40.25	\$3.30	\$3.41

Figure 4-26 Real-time interchange volume vs. average hourly LMP available for Duke and PEC imports: January through March 2010 (See 2009 SOM, Figure 4-26)

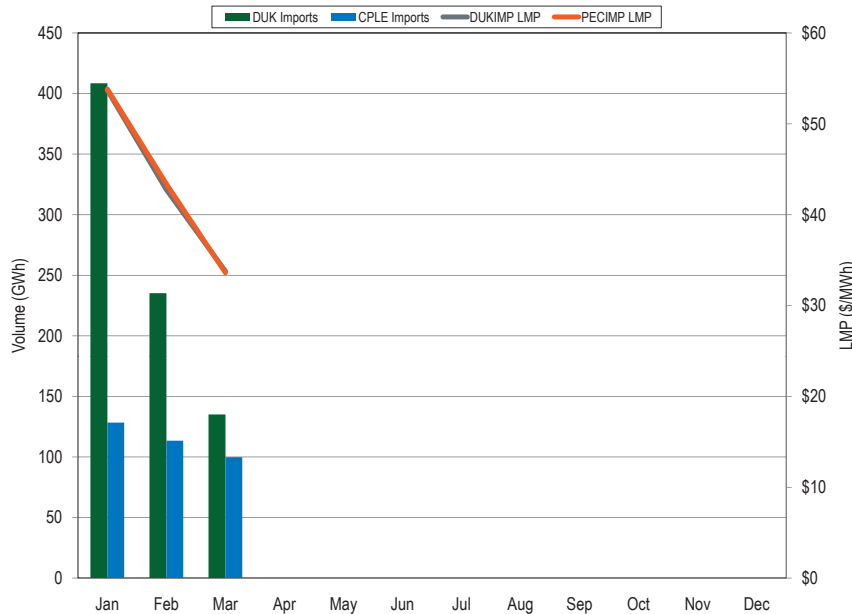


Figure 4-27 Real-time interchange volume vs. average hourly LMP available for Duke and PEC exports: January through March 2010 (See 2009 SOM, Figure 4-27)

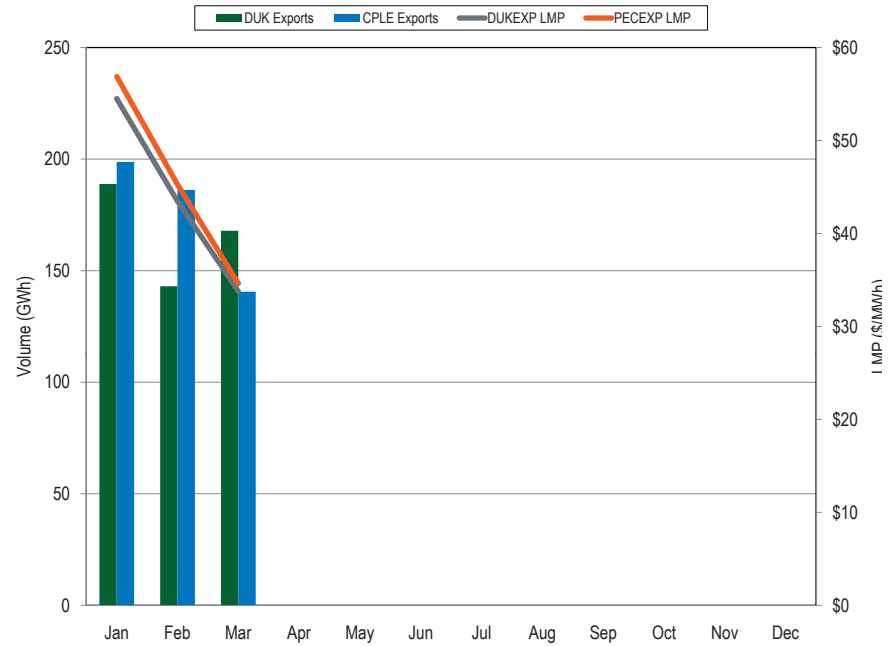


Table 4-17 Day-ahead average hourly LMP comparison for Duke, PEC and NCMPA: January through March 2010 (See 2009 SOM, Table 4-19)

	IMPORT LMP	EXPORT LMP	SOUTHIMP	SOUTHEXP	Difference IMP LMP - SOUTHIMP	Difference EXP LMP - SOUTHEXP
Duke	\$45.27	\$46.83	\$41.63	\$41.63	\$3.64	\$5.19
PEC	\$46.06	\$48.61	\$41.63	\$41.63	\$4.42	\$6.98
NCMPA	\$45.86	\$46.02	\$41.63	\$41.63	\$4.22	\$4.38

Figure 4-28 Day-ahead interchange volume vs. average hourly LMP available for Duke and PEC imports: January through March 2010 (See 2009 SOM, Figure 4-28)

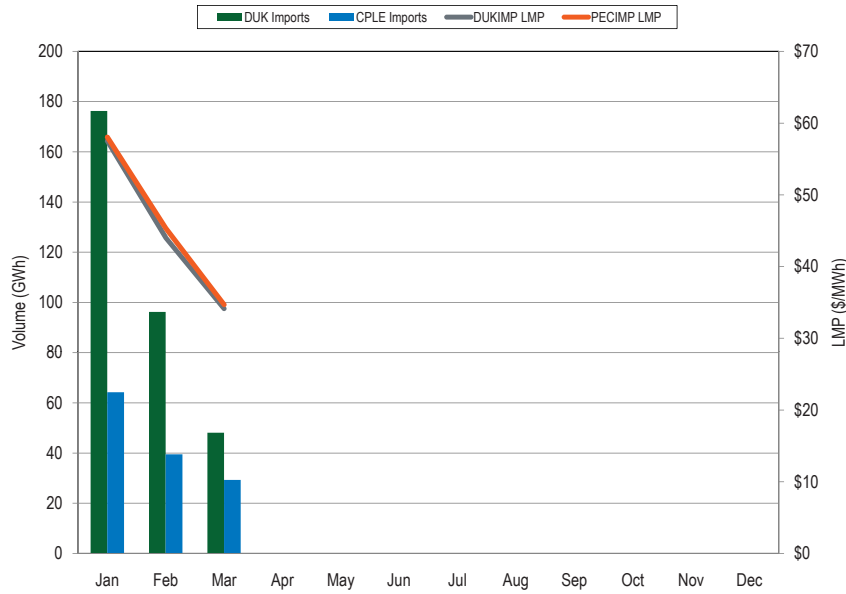
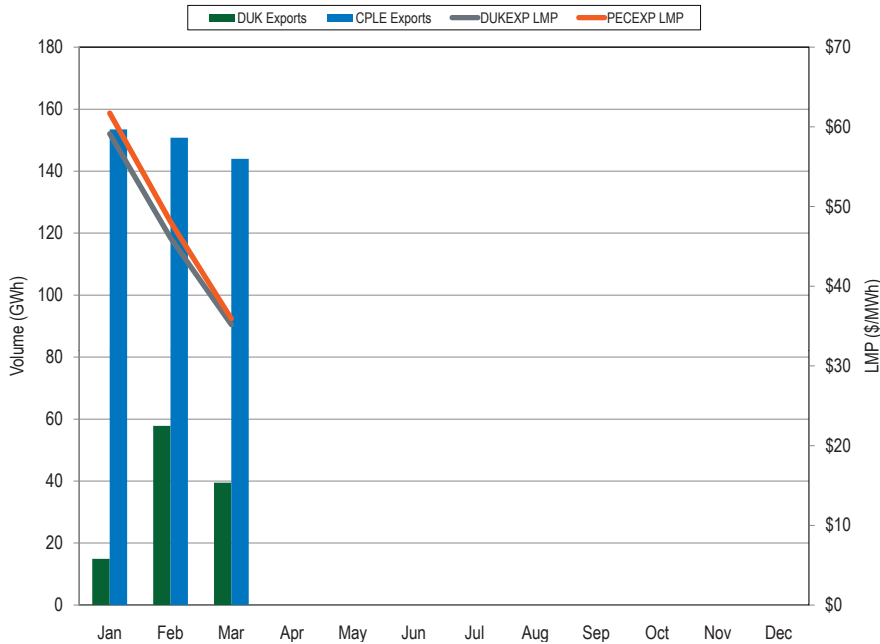
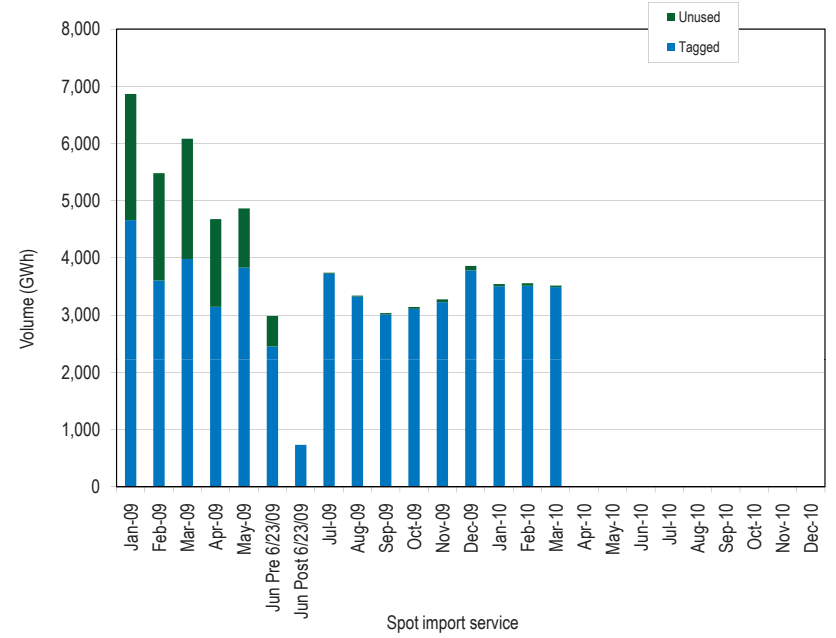


Figure 4-29 Day-ahead interchange volume vs. average hourly LMP available for Duke and PEC exports: January through March 2010 (See 2009 SOM, Figure 4-29)



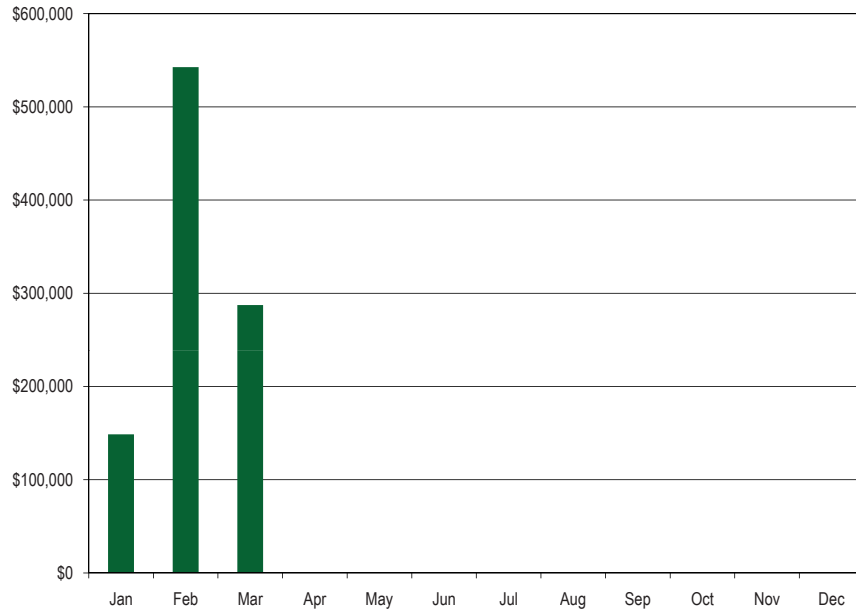
Spot Import

Figure 4-30 Spot import service utilization: January 2009 through March 2010 (See 2009 SOM, Figure 4-30)



Willing to Pay Congestion and Not Willing to Pay Congestion

Figure 4-31 Monthly uncollected congestion charges: January through March 2010 (See 2009 SOM, Figure 4-31)



Ramp Availability

Figure 4-32 Distribution of expired ramp reservations in the hour prior to flow (Old rules (Theoretical) and new rules (Actual)) October 2006 through March 2010 (See 2009 SOM, Figure 4-32)

