

## 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 six months of 2010, PJM was a net exporter of energy in the Real-Time Market in all months. In the Real-Time Market, monthly net interchange averaged -559 GWh.<sup>1</sup> Gross monthly import volumes averaged 3,509 GWh while gross monthly exports averaged 4,068 GWh.
- **Aggregate Imports and Exports in the Day-Ahead Market.** During the first six months of 2010, PJM was a net exporter of energy in the Day-Ahead Market in all months. In the Day-Ahead Market, monthly net interchange averaged -915 GWh. Gross monthly import volumes averaged 5,716 GWh while gross monthly exports averaged 6,631 GWh.
- **Aggregate Imports and Exports in the Day-Ahead Market versus the Real-Time Market.** During the first six months of 2010, gross imports in the Day-Ahead Energy Market were 163 percent of the Real-Time Market's gross imports (111 percent for the calendar year 2009), gross exports in the Day-Ahead Market were 163 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 164 percent of net interchange in the Real-Time Energy Market (-3,356 GWh in the Real-Time Market and -5,490 GWh in the Day-Ahead Market).
- **Interface Imports and Exports in the Real-Time Market.** In the Real-Time Market, during the first six months of 2010, there were net exports at 12 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 39 percent, PJM/Neptune (NEPT) with 27 percent and PJM/First Energy Corporation (FE) with 7 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 73 percent of the total net PJM exports in the Real-Time Market. Seven PJM interfaces had net imports, with two importing interfaces accounting for 73 percent of the total net imports: PJM/Ohio Valley Electric Corporation (OVEC) with 60 percent and PJM/Michigan Electric Coordinated System (MECS) with 13 percent.<sup>2</sup>

- **Interface Imports and Exports in the Day-Ahead Market.** In the Day-Ahead Market, during the first six months of 2010, there were net exports at 13 of PJM's 21 interfaces. The top four net exporting interfaces accounted for 83 percent of the total net exports: PJM/western Alliant Energy Corporation (ALTW) with 35 percent, PJM/NYIS with 18 percent, PJM/MidAmerican Energy Company (MEC) with 16 percent and PJM/NEPT with 14 percent. There are three separate interfaces that connect PJM to the NYISO (PJM/NYIS, PJM/NEPT and PJM/Linden (LIND)). Combined, these interfaces made up 32 percent of the total net PJM exports in the Day-Ahead Market.<sup>3</sup> Eight PJM interfaces had net imports in the Day-Ahead Market, with two interfaces accounting for 81 percent of the total net imports: PJM/OVEC with 48 percent and PJM/Michigan Electric Coordinated System (MECS) with 34 percent.

#### Interactions with Bordering Areas

##### *PJM Interface Pricing with Organized Markets*

- **PJM and Midwest Independent System Operator (MISO) Interface Prices.** During the first six 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 six months of 2010, the PJM average hourly

<sup>1</sup> 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.

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

<sup>3</sup> The Linden Interface accounted for less than 1 percent of the total net exports in the Day-Ahead Market during the first six months of 2010.

Locational Marginal Price (LMP) at the PJM/MISO border was \$33.77 while the Midwest ISO LMP at the border was \$33.87, a difference of \$0.10. While the average hourly flow reflected imports into PJM from the Midwest ISO, further analysis of hourly interchange showed patterns of expected market participant response that created price convergence at the PJM/MISO Interface.

- **PJM and New York ISO Interface Prices.** During the first six 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 six months of 2010, the PJM average hourly LMP at the PJM/NYISO border was \$45.16 while the NYISO LMP at the border was \$43.16, a difference of \$2.00. 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).**<sup>4</sup> 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 six 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.”<sup>5</sup>

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*.<sup>6</sup> On July 15, 2010, the Commission conditionally accepted the NYISO Report subject to the parties filing answers to the questions set forth in the order within 30 days of the date of the order.<sup>7</sup> The Commission requested that the parties provide additional evidence regarding the proposed solutions. Intervenors, including the MMU, will be permitted to submit comments addressing those submissions 30 days thereafter.

- **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 six 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 if they were one large control area. The MMU believes that this approach should be the 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.<sup>8</sup> 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.<sup>9</sup> On March 8, 2010, after the settlement discussions mediated by the Federal Energy Regulatory Commission (FERC)

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](http://www.nyiso.com/public/webdocs/documents/regulatory/filings/2010/01/NYISO_Rpt_BRM_01_12_10FNL.pdf)> (131 KB).

7 132 FERC ¶61,031.

8 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).

9 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).

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.

ended, the Midwest ISO filed complaints with FERC against PJM.<sup>10</sup> On April 12, 2010, PJM answered and filed a counter complaint.<sup>11</sup> These matters are now pending before the Commission in settlement proceeding.<sup>12</sup> The MMU remains concerned that this disagreement 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, but notes that the *Memorandum of Understanding* signed by PJM and the Midwest ISO on May 27, 2010 “reaffirms the value of the agreement and pledges continued cooperation to develop new practices to improve the interface between the two organizations”<sup>13</sup>.

- **PJM, Midwest ISO and TVA Joint Reliability Coordination Agreement.**<sup>14</sup> 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 six months of 2010.
- **PJM and Progress Energy Carolinas, Inc. Joint Operating Agreement.**<sup>15</sup> 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 six 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.<sup>16</sup> The MMU responded to the filing on February 23, 2010.<sup>17</sup> 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.<sup>18</sup> On May 28, 2010, the Commission conditionally approved the revised PJM/PEC JOA.<sup>19</sup> PJM and PEC were required to make a compliance filing within thirty days of the date of the order answering specific questions related to the impact of the dynamic scheduling arrangement on NERC standards and discriminatory access, the market pricing mechanisms with regards to eliminating the nuclear and hydro units from the calculation and the discriminatory use of export make whole payments under this agreement. On June 28, 2010, PJM and PEC filed their response.<sup>20</sup> The MMU responded to the compliance filing on July 19, 2010, reiterating the argument that the PJM/PEC JOA provides for preferential treatment to ATC and that the elimination of nuclear and hydro units from the interface price calculation is not consistent with the economics of locational marginal pricing.<sup>21</sup>

- **PJM and Virginia and Carolinas Area (VACAR) South Reliability Coordination Agreement.**<sup>22</sup> 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 six months of 2010, PJM continued to operate under the terms of the operating protocol developed in 2005.<sup>23</sup> The protocol allows Con Edison to elect up to the flow specified in each contract through the PJM Day-Ahead Energy Market. These elections are transactions in the PJM Day-Ahead Energy Market. The 600 MW contract is for firm service and the 400 MW contract has a priority higher than non-firm service, but lower than firm service. These elections obligate PSE&G to pay congestion costs associated with the daily elected level of service under the 600 MW contract and obligate

<sup>10</sup> 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).

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

<sup>12</sup> 131 FERC ¶61,284 (June 29, 2010).

<sup>13</sup> See PJM. “PJM-MISO-MOU-May-2010” (May 27, 2010) (Accessed June 15, 2010) <<http://www.pjm.com/documents/agreements/-/media/documents/agreements/pjm-miso-mou-may-2010.ashx>> (313 KB).

<sup>14</sup> 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).

<sup>15</sup> 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).

<sup>16</sup> See PJM Interconnection, L.L.C. and Progress Energy Carolinas, Inc. Docket No. ER10-713-000 (February 2, 2010).

<sup>17</sup> 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](http://www.monitoringanalytics.com/reports/Reports/2010/IMM_Motion_to_Intervene_and_Comments_ER10-713-000_20100225.pdf)> (225 KB).

<sup>18</sup> 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.

<sup>19</sup> See Docket No. ER10-713-000. Amended and Restated Joint Operating Agreement Among and Between PJM Interconnection, L.L.C., and Progress Energy Carolinas.

<sup>20</sup> See PJM/PEC compliance filing in Docket No. ER10-713-002.

<sup>21</sup> See IMM response to PJM/PEC compliance filing in Docket No. ER10-713-002.

<sup>22</sup> 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).

<sup>23</sup> 111 FERC ¶ 61,228 (2005).

Con Edison to pay congestion costs associated with the daily elected level of service under the 400 MW contract.

Under the FERC order, PSE&G is assigned FTRs associated with the 600 MW contract. The PSE&G FTRs are treated like all other FTRs. In the first six months of 2010, PSE&G's FTR credits were \$154,636 less than the congestion charges because, for the entire PJM FTR Market, revenue was insufficient to fully fund FTRs. Under the FERC order, Con Edison receives credits, on an hourly basis, for its elections under the 400 MW contract from a pool containing any excess congestion revenue after hourly FTRs are funded. In the first six months of 2010, Con Edison's congestion credits were less than the associated congestion charges by approximately \$1.2 million.

In effect, Con Edison has been given congestion credits that are equivalent to a class of FTRs covering positive congestion with subordinated rights to revenue. However, Con Edison is not treated as having an FTR when congestion is negative. An FTR holder in that position would pay the negative congestion credits, but Con Edison does not. During the first six months of 2010, Con Edison's negative congestion credits would have been approximately \$10,000.

Under the terms of the protocol, Con Edison can make a real-time election of its desired flow for each hour in the Real-Time Energy Market. If this election differs from its day-ahead schedule, the company is subject to the resultant charges or credits. This occurred in six percent of the hours during the first six months of 2010.

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 rollover of the agreements under the PJM OATT.<sup>24</sup> After NRG and FERC trial staff contested the settlement, the Commission found that the record does not sufficiently address "threshold issues" concerning the rollover of these contracts, including the impact on locational marginal pricing, and whether this result would be unduly discriminatory.<sup>25</sup> 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.<sup>26</sup>

The MMU has reviewed the briefs filed in this proceeding on April 21, 2010, and believes that they raise questions about whether allowing rollover is appropriate.<sup>27</sup> 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. On May 11, 2010, the MMU offered comments on the issues raised by the Commission, noting that "the settling parties fail to demonstrate any circumstances that may now exist warranting a non-conforming agreement under the current approach to seams management, nor do they attempt to explain how such circumstances would continue to exist under the reforms to be implemented through the Broader Regional Markets Initiative." Additionally, "the settling parties have failed to show that continuation of the grandfathered transmission service agreements will neither interfere with the efficient calculation of LMPs in both PJM and the NYISO, and at their interface, nor harm the ability of parties to efficiently transact business".<sup>28</sup>

- **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.<sup>29</sup> The basis for this limitation is unclear. Over the first six months of 2010, the PJM average hourly LMP at the Neptune Interface was \$47.71 while the NYISO LMP at the Neptune Bus was \$56.68, a difference of \$8.97. The average hourly flow during the first six months of 2010 was -586 MW, which aligned with price differentials in only 60 percent of all hours during the first six 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

<sup>24</sup> See Docket Nos. ER08-858-000, et al. 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.

<sup>25</sup> 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.")

<sup>26</sup> *Id.*

<sup>27</sup> 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.

<sup>28</sup> See Motion to Intervene Out-of-Time and Comments of the Independent Market Monitor for PJM in Docket No. ER08-858-000, et al.

<sup>29</sup> See PJM, "PJM Open Access Transmission Tariff" (July 21, 2010) (Accessed August 7, 2010) <<http://www.pjm.com/documents/~media/documents/agreements/tariff.ashx>> (9,403 KB).

regulating transformer.<sup>30</sup> 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.<sup>31</sup> The basis for this limitation is unclear. Over the first six months of 2010, the PJM average hourly LMP at the Linden Interface was \$47.74 while the NYISO LMP at the Linden Bus was \$51.07, a difference of \$3.33. The average hourly flow during the first six months of 2010 was -148 MW, which aligned with price differentials in only 56 percent of all hours during the first six 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 six months of 2010, net scheduled interchange was -2,307 GWh and net actual interchange was -2,132 GWh for a difference of 175 GWh or 7.6 percent (3.3 percent for the first six months of 2009). The net totals in the first three months of 2010 reflected a large mismatch between scheduled and actual interchange (21.4 percent). An evaluation of the monthly net flows showed that the values had been converging. As the net scheduled export levels increased in the second quarter of 2010, the year to date net difference, as a percentage of the year to date scheduled interchange decreased. 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 (-7,667 GWh during the first six months of 2010 and -7,563 GWh during the first six months of 2009). The PJM/TVA Interface also exhibited large mismatches between scheduled and actual power flows (1,954 GWh during the first six months of 2010 and 1,827 GWh during the first six months of 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 (CPL), PJM/western portion of Carolina Power & Light Company (CPLW) and PJM/DUK to the east) was significant during the first six months of 2010.

The southern interfaces have historically experienced significant loop flows.<sup>32</sup> 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 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 \$4.26 during the first six months of 2010 and the average difference between LMP at the Southwest pricing points and the SouthEXP pricing point was -\$2.97 during the first six 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

<sup>30</sup> 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.

<sup>31</sup> See PJM, "PJM Open Access Transmission Tariff" (July 21, 2010) (Accessed August 7, 2010) <<http://www.pjm.com/documents/-/media/documents/agreements/tariff.ashx>> (9,884 KB).

<sup>32</sup> 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](http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2002/SOM2002-part2.pdf)> (4,068 KB).

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 six months of 2010, PJM issued 58 TLRs. Of the 58 TLRs issued, the highest levels reached were TLR 3a for 33 events and TLR 3b for the remaining 25 events. Figure 4-22 shows that there was an increase in the number of TLRs issued by PJM in June 2010. The increase in TLRs, as well as the increase in the total MWh of curtailed transactions resulting from those TLRs, was primarily the result of increased weather related load. 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 58 TLRs during the first six months of 2010, compared to 90 during the first six months of 2009, 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 June 30, 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 5,054.2 GWh. In June 2010, a single market participant submitted a large quantity of up-to congestion bids. The activities of this one participant accounted for the significant increase in total up-to congestion MWh as shown in Figure 4-23.

The up-to congestion transactions during the first six months of 2010 were comprised of 47.3 percent imports, 49.5 percent exports and 3.2 percent wheeling transactions. Only 0.2 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, 95.9 percent were exports and 4.0 percent were wheel through transactions.

When the up-to congestion product was used as intended, with matching Real-Time Market transactions, 79.4 percent of the total cleared transaction MW were profitable during the first six months of 2010. The net profit on all these transactions was approximately \$357,000. When up-to congestion transactions did not have a matching Real-Time Market transaction, 56.7 percent of the total cleared transaction MW were profitable. The net loss on all these transactions was approximately \$26.5 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 six months of 2010 were approximately \$1.2 Million (\$62,764 for the first six months of 2009). The increase in uncollected congestion charges has been caused by an increase in market participant use of not willing to pay congestion transmission on their energy transactions in 2010. The MMU recommended 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. A change to PJM's EES application is currently in development that will evaluate transactions, which have not willing to pay congestion transmission reservations associated with them, that are either flowing or are about to start. Those transactions will be compared to LMP data to determine whether they should be curtailed (if already flowing) or

prevented from starting. The EES modifications are expected to be released into production in the third quarter of 2010.

- **Elimination of Sources and Sinks.** The MMU has recommended that PJM eliminate the internal source and sink bus designations from external energy transaction scheduling in the PJM Day-Ahead and Real-Time Markets. Designating a specific internal bus at which a market participant buys or sells energy creates a mismatch between the day-ahead and real-time energy flows, as it is impossible to control where the power will actually flow based on the physics of the system, and can affect the day-ahead clearing price, which can affect other participant positions. Market inefficiencies are created when the day-ahead dispatch does not match the real-time dispatch.

The issue of uncollected congestion from not willing to pay congestion transmission reservations would also be mitigated by the elimination of internal sources and sinks from the Real-Time PJM Energy Market. Because only interfaces would be permitted to be specified as a valid source and sink on an external energy transaction, the only opportunity for congestion exposure would be for wheeling transactions, as all external imports and exports would have the source and sink specified as the same bus (i.e. the interface where the transaction enters or leaves the PJM Market) which, by definition, would represent no congestion exposure.

Until the internal source and sink designations are eliminated from the external energy transactions in the Day-Ahead Energy Market, the MMU continues to recommend that PJM require that all import and export up-to congestions transactions pay day-ahead and balancing operating reserve charges. This would continue to exclude wheel through transactions from operating reserve charges. Up-to congestion transactions are being used as matching INC and DEC bids and have corresponding impacts on the need for operating reserve charges.

## 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.

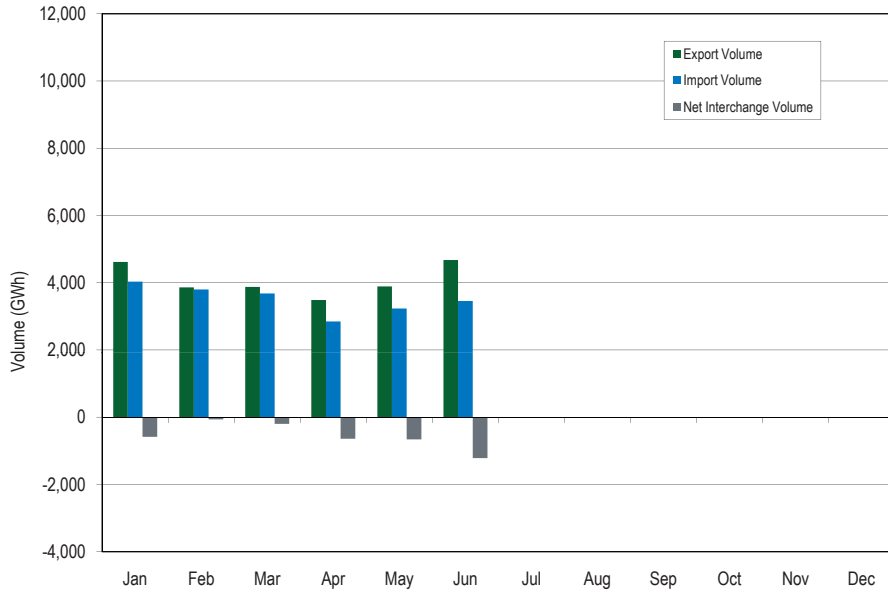
The MMU analyzed the transactions between PJM and its neighboring balancing authorities for the first six months of 2010, including evolving transaction patterns, economics and issues. During the first six months of 2010, PJM was a net exporter of energy and a large share of both import and export activity 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 73 percent of the real-time net import volume. Four interfaces accounted for 83 percent of the total day-ahead net exports and two interfaces accounted for 81 percent of the day-ahead net import volume.

Interactions between PJM and other balancing authorities should be governed by the same market principles that govern transactions within PJM. That is not yet the case. The MMU recommends that PJM ensure that all the arrangements between PJM and other balancing authorities be reviewed and modified as necessary to ensure consistency with basic market principles and that PJM not enter into any additional arrangements that are not consistent with basic market principles.

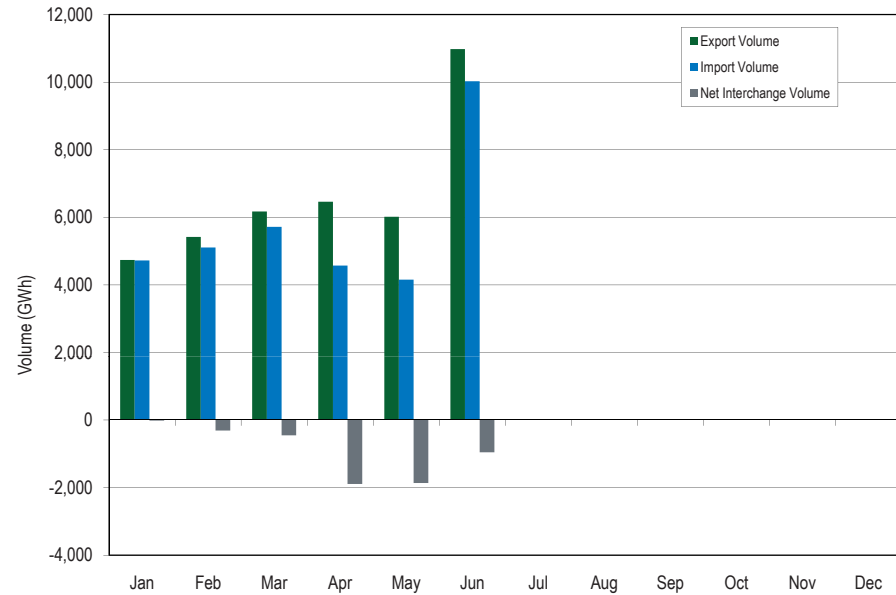
**Interchange Transaction Activity**

**Aggregate Imports and Exports**

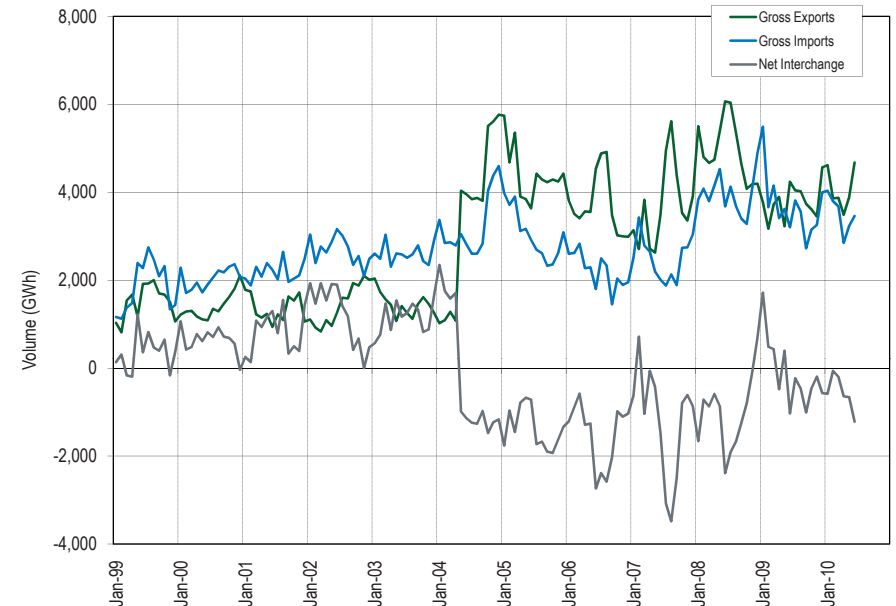
**Figure 4-1 PJM real-time scheduled imports and exports: January through June 2010 (See 2009 SOM, Figure 4-1)**



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



**Figure 4-3 PJM scheduled import and export transaction volume history: 1999 through June 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 June 2010 (See 2009 SOM, Table 4-1)

	Jan	Feb	Mar	Apr	May	Jun	Total
CPLC	(70.4)	(72.8)	(40.8)	(141.2)	(114.0)	(154.2)	(593.4)
CPLW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DUK	219.7	92.2	(32.8)	(22.9)	123.6	(116.4)	263.4
EKPC	(65.5)	(99.2)	14.1	39.3	(0.2)	(19.5)	(131.0)
LGEE	31.9	144.5	29.7	44.1	116.8	130.0	497.0
MEC	(454.2)	(422.0)	(458.1)	(383.0)	(436.0)	(429.4)	(2,582.7)
MISO	(74.1)	512.4	510.7	8.1	188.5	(327.7)	817.9
ALTE	3.6	(9.5)	13.7	(7.1)	(0.7)	(66.2)	(66.2)
ALTW	(32.1)	(8.4)	1.4	(16.1)	(27.7)	(148.3)	(231.2)
AMIL	(141.6)	(85.5)	(63.5)	(25.6)	37.1	18.8	(260.3)
CIN	78.4	323.4	233.5	(112.2)	189.0	155.8	867.9
CWLP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FE	(117.4)	(60.2)	(70.6)	(114.3)	(142.5)	(173.5)	(678.5)
IPL	(28.4)	48.4	(4.6)	112.6	61.3	(61.2)	128.1
MECS	195.1	312.7	387.5	199.7	95.9	103.2	1,294.1
NIPS	(24.0)	(10.8)	(4.9)	(0.6)	(1.9)	(111.1)	(153.3)
WEC	(7.7)	2.3	18.2	(28.3)	(22.0)	(45.2)	(82.7)
NYISO	(1,307.0)	(1,039.9)	(1,109.6)	(950.3)	(1,334.9)	(1,257.1)	(6,998.8)
LIND	(146.0)	(125.5)	(115.7)	(75.8)	(89.8)	(100.4)	(653.2)
NEPT	(496.7)	(423.6)	(449.9)	(280.9)	(464.8)	(466.6)	(2,582.5)
NYIS	(664.3)	(490.8)	(544.0)	(593.6)	(780.3)	(690.1)	(3,763.1)
OVEC	1,176.9	943.0	1,018.8	854.0	805.9	1,001.9	5,800.5
TVA	(39.0)	(121.5)	(129.3)	(88.3)	(7.8)	(43.4)	(429.3)
Total	(581.7)	(63.3)	(197.3)	(640.2)	(658.1)	(1,215.8)	(3,356.4)

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

	Jan	Feb	Mar	Apr	May	Jun	Total
CPLC	128.3	113.4	99.8	0.6	22.7	9.9	374.7
CPLW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DUK	408.5	235.2	135.1	142.6	258.6	174.8	1,354.8
EKPC	15.8	3.0	53.9	58.1	34.8	36.6	202.2
LGEE	48.9	150.5	73.5	58.7	135.6	161.8	629.0
MEC	44.1	28.1	35.7	52.3	61.5	34.7	256.4
MISO	1,142.9	1,388.4	1,292.1	852.6	907.3	1,055.0	6,638.3
ALTE	30.0	8.0	28.9	2.4	9.4	1.0	79.7
ALTW	0.0	5.4	7.6	1.1	2.8	6.3	23.2
AMIL	23.5	49.2	39.2	45.6	55.0	37.1	249.6
CIN	500.9	555.4	454.8	227.2	364.7	551.6	2,654.6
CWLP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FE	181.6	207.6	205.4	156.0	147.5	162.3	1,060.4
IPL	47.1	116.7	16.2	115.9	113.5	71.8	481.2
MECS	304.3	385.9	475.1	283.7	181.5	185.2	1,815.7
NIPS	0.0	0.0	0.0	0.2	13.4	6.4	20.0
WEC	55.5	60.2	64.9	20.5	19.5	33.3	253.9
NYISO	934.4	901.2	922.5	765.7	890.8	916.1	5,330.7
LIND	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NEPT	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NYIS	934.4	901.2	922.5	765.7	890.8	916.1	5,330.7
OVEC	1,176.9	943.0	1,018.8	854.0	805.9	1,001.9	5,800.5
TVA	134.6	35.7	47.7	63.0	115.6	67.9	464.5
Total	4,034.4	3,798.5	3,679.1	2,847.6	3,232.8	3,458.7	21,051.1

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

	Jan	Feb	Mar	Apr	May	Jun	Total
CPLC	198.7	186.2	140.6	141.8	136.7	164.1	968.1
CPLW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DUK	188.8	143.0	167.9	165.5	135.0	291.2	1,091.4
EKPC	81.3	102.2	39.8	18.8	35.0	56.1	333.2
LGEE	17.0	6.0	43.8	14.6	18.8	31.8	132.0
MEC	498.3	450.1	493.8	435.3	497.5	464.1	2,839.1
MISO	1,217.0	876.0	781.4	844.5	718.8	1,382.7	5,820.4
ALTE	26.4	17.5	15.2	9.5	10.1	67.2	145.9
ALTW	32.1	13.8	6.2	17.2	30.5	154.6	254.4
AMIL	165.1	134.7	102.7	71.2	17.9	18.3	509.9
CIN	422.5	232.0	221.3	339.4	175.7	395.8	1,786.7
CWLP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FE	299.0	267.8	276.0	270.3	290.0	335.8	1,738.9
IPL	75.5	68.3	20.8	3.3	52.2	133.0	353.1
MECS	109.2	73.2	87.6	84.0	85.6	82.0	521.6
NIPS	24.0	10.8	4.9	0.8	15.3	117.5	173.3
WEC	63.2	57.9	46.7	48.8	41.5	78.5	336.6
NYISO	2,241.4	1,941.1	2,032.1	1,716.0	2,225.7	2,173.2	12,329.5
LIND	146.0	125.5	115.7	75.8	89.8	100.4	653.2
NEPT	496.7	423.6	449.9	280.9	464.8	466.6	2,582.5
NYIS	1,598.7	1,392.0	1,466.5	1,359.3	1,671.1	1,606.2	9,093.8
OVEC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TVA	173.6	157.2	177.0	151.3	123.4	111.3	893.8
Total	4,616.1	3,861.8	3,876.4	3,487.8	3,890.9	4,674.5	24,407.5

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

	Jan	Feb	Mar	Apr	May	Jun	Total
CPLC	(89.3)	(111.3)	(114.7)	(122.2)	(108.3)	(134.2)	(680.0)
CPLW	10.2	(1.0)	1.0	(0.9)	(1.0)	(1.5)	6.8
DUK	161.4	38.4	8.6	12.6	72.5	23.2	10.8
EKPC	(1.5)	(5.9)	(3.4)	(0.2)	(1.4)	(3.0)	(60.1)
LGEE	1.0	5.3	0.0	(0.1)	1.4	(8.0)	(30.9)
MEC	(479.4)	(444.1)	(482.8)	(433.0)	(464.1)	(789.0)	(3,126.4)
MISO	282.3	(160.5)	(312.1)	(1,450.5)	(1,018.5)	550.4	(2,108.9)
ALTE	227.6	(257.5)	(136.2)	(302.4)	(711.0)	(168.0)	(1,347.5)
ALTW	(282.2)	(414.3)	(1,220.9)	(1,761.3)	(766.8)	(2,195.9)	(6,641.4)
AMIL	14.4	97.5	6.7	12.4	44.5	114.6	290.1
CIN	182.9	(60.8)	43.1	(70.3)	41.8	310.0	446.7
CWLP	0.0	0.0	0.0	0.0	(0.3)	0.0	(0.3)
FE	(70.5)	(20.7)	118.8	(72.4)	(79.3)	390.4	266.3
IPL	(53.4)	(18.4)	(44.7)	(8.5)	(42.0)	68.9	(98.1)
MECS	387.8	654.4	885.6	732.9	546.6	1,223.9	4,431.2
NIPS	(204.5)	(217.0)	(143.3)	(87.6)	(120.2)	(103.9)	(876.5)
WEC	80.2	76.3	178.8	106.7	68.2	910.4	1,420.6
NYISO	(969.0)	(912.0)	(825.4)	(752.7)	(1,017.9)	(1,657.9)	(6,134.9)
LIND	(21.1)	(18.3)	(53.2)	(11.4)	(15.3)	(12.0)	(131.3)
NEPT	(502.6)	(445.2)	(456.7)	(301.3)	(473.4)	(472.7)	(2,651.9)
NYIS	(445.3)	(448.5)	(315.5)	(440.0)	(529.2)	(1,173.2)	(3,351.7)
OVEC	1,074.0	1,243.3	1,300.5	917.1	679.0	1,058.2	6,272.1
TVA	(5.3)	37.8	(27.0)	(60.9)	(5.4)	7.7	(53.1)
Total	(15.6)	(310.0)	(455.3)	(1,890.8)	(1,863.7)	(954.1)	(5,489.5)

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

	Jan	Feb	Mar	Apr	May	Jun	Total
CPLC	64.2	39.5	29.3	10.7	15.8	49.1	208.6
CPLW	15.6	0.6	1.8	0.0	1.4	0.8	20.2
DUK	176.3	96.2	48.1	40.2	107.2	77.8	545.8
EKPC	0.0	0.0	0.4	0.0	0.0	0.0	0.4
LGEE	1.0	5.4	0.0	0.0	1.8	0.5	8.7
MEC	18.8	5.6	12.2	18.6	70.2	158.8	284.2
MISO	2,400.5	2,738.3	3,112.5	2,678.8	2,251.6	7,455.1	20,636.8
ALTE	866.4	762.4	662.8	382.9	263.8	721.2	3,659.5
ALTW	72.0	67.2	72.4	53.6	40.2	345.7	651.1
AMIL	68.1	157.9	50.5	32.1	44.8	114.6	468.0
CIN	436.8	592.0	555.1	590.4	430.6	969.6	3,574.5
CWLP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FE	156.2	176.9	364.9	203.7	179.3	752.7	1,833.7
IPL	26.9	29.4	30.7	102.8	97.0	1,045.3	1,332.1
MECS	606.2	801.7	1,125.2	1,118.7	1,035.2	2,223.8	6,910.8
NIPS	28.6	19.5	24.3	33.1	26.9	292.1	424.5
WEC	139.3	131.3	226.6	161.5	133.8	990.1	1,782.6
NYISO	835.3	885.1	1,095.7	883.7	858.1	1,165.0	5,722.9
LIND	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NEPT	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NYIS	835.3	885.1	1,095.7	883.7	858.1	1,165.0	5,722.9
OVEC	1,133.2	1,259.7	1,379.9	922.0	802.1	1,063.8	6,560.7
TVA	75.9	77.8	36.7	15.2	44.4	55.3	305.3
Total	4,720.8	5,108.2	5,716.6	4,569.2	4,152.6	10,026.2	34,293.6

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

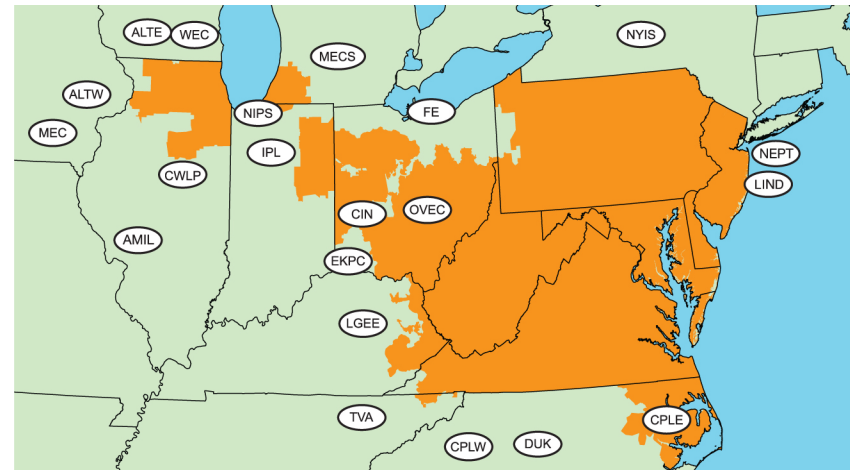
	Jan	Feb	Mar	Apr	May	Jun	Total
CPLC	153.5	150.8	144.0	132.9	124.1	183.3	888.6
CPLW	5.4	1.6	0.8	0.9	2.4	2.3	13.4
DUK	14.9	57.8	39.5	27.6	34.7	54.6	535.0
EKPC	1.5	5.9	3.8	0.2	1.4	3.0	60.5
LGEE	0.0	0.1	0.0	0.1	0.4	8.5	39.6
MEC	498.2	449.7	495.0	451.6	534.3	947.8	3,410.6
MISO	2,118.2	2,898.8	3,424.6	4,129.3	3,270.1	6,904.7	22,745.7
ALTE	638.8	1,019.9	799.0	685.3	974.8	889.2	5,007.0
ALTW	354.2	481.5	1,293.3	1,814.9	807.0	2,541.6	7,292.5
AMIL	53.7	60.4	43.8	19.7	0.3	0.0	177.9
CIN	253.9	652.8	512.0	660.7	388.8	659.6	3,127.8
CWLP	0.0	0.0	0.0	0.0	0.3	0.0	0.3
FE	226.7	197.6	246.1	276.1	258.6	362.3	1,567.4
IPL	80.3	47.8	75.4	111.3	139.0	976.4	1,430.2
MECS	218.4	147.3	239.6	385.8	488.6	999.9	2,479.6
NIPS	233.1	236.5	167.6	120.7	147.1	396.0	1,301.0
WEC	59.1	55.0	47.8	54.8	65.6	79.7	362.0
NYISO	1,804.3	1,797.1	1,921.1	1,636.4	1,876.0	2,822.9	11,857.8
LIND	21.1	18.3	53.2	11.4	15.3	12.0	131.3
NEPT	502.6	445.2	456.7	301.3	473.4	472.7	2,651.9
NYIS	1,280.6	1,333.6	1,411.2	1,323.7	1,387.3	2,338.2	9,074.6
OVEC	59.2	16.4	79.4	4.9	123.1	5.6	288.6
TVA	81.2	40.0	63.7	76.1	49.8	47.6	358.4
Total	4,736.4	5,418.2	6,171.9	6,460.0	6,016.3	10,980.3	39,783.1

**Interface Pricing**

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

	Jan	Feb	Mar	Apr	May	Jun
ALTE	Active	Active	Active	Active	Active	Active
ALTW	Active	Active	Active	Active	Active	Active
AMIL	Active	Active	Active	Active	Active	Active
CIN	Active	Active	Active	Active	Active	Active
CPLW	Active	Active	Active	Active	Active	Active
DUK	Active	Active	Active	Active	Active	Active
EKPC	Active	Active	Active	Active	Active	Active
FE	Active	Active	Active	Active	Active	Active
IPL	Active	Active	Active	Active	Active	Active
LGEE	Active	Active	Active	Active	Active	Active
LIND	Active	Active	Active	Active	Active	Active
MEC	Active	Active	Active	Active	Active	Active
MECS	Active	Active	Active	Active	Active	Active
NEPT	Active	Active	Active	Active	Active	Active
NIPS	Active	Active	Active	Active	Active	Active
NYIS	Active	Active	Active	Active	Active	Active
OVEC	Active	Active	Active	Active	Active	Active
TVA	Active	Active	Active	Active	Active	Active
WEC	Active	Active	Active	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 June 2010 (See 2009 SOM, Table 4-8)**

PJM 2010 Pricing Points (January through June)			
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 June 2010 (See 2009 SOM, Figure 4-5)

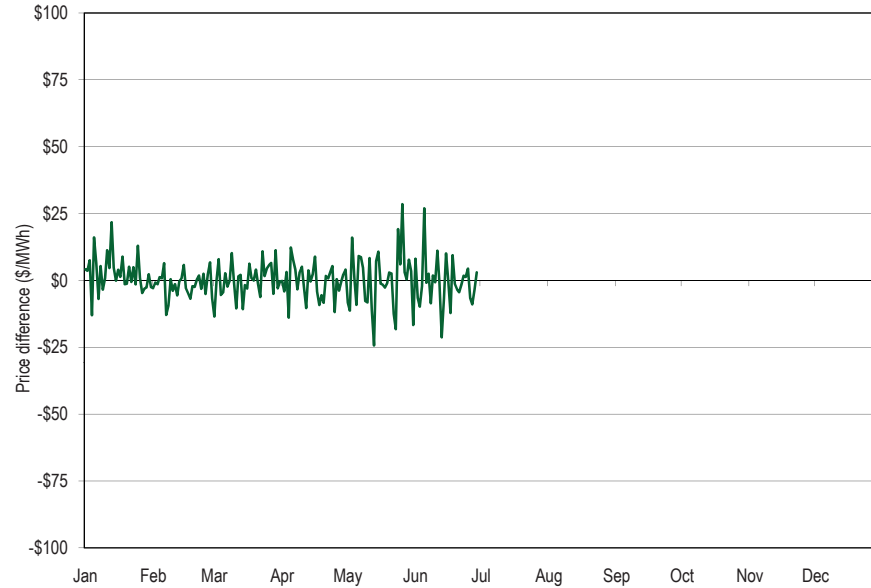
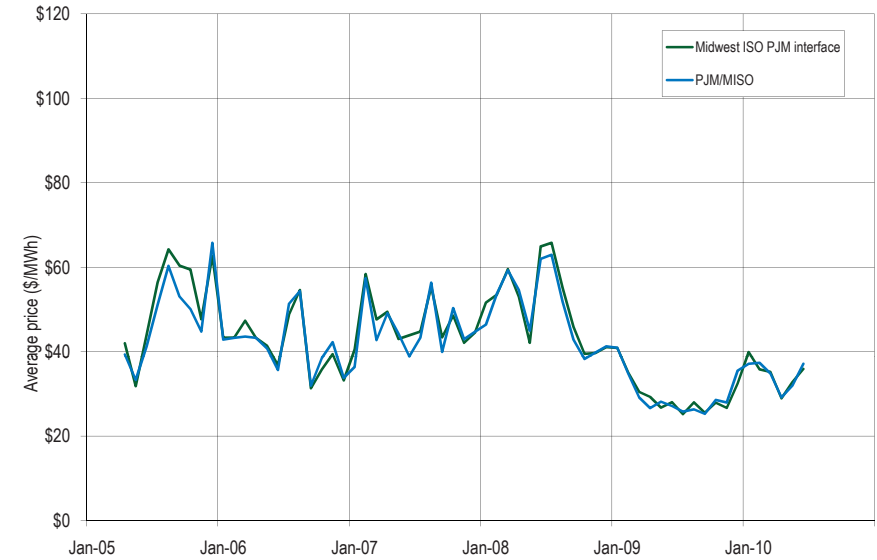


Figure 4-6 Real-time monthly hourly average Midwest ISO PJM interface price and the PJM/MISO price: April 2005 through June 2010 (See 2009 SOM, Figure 4-6)

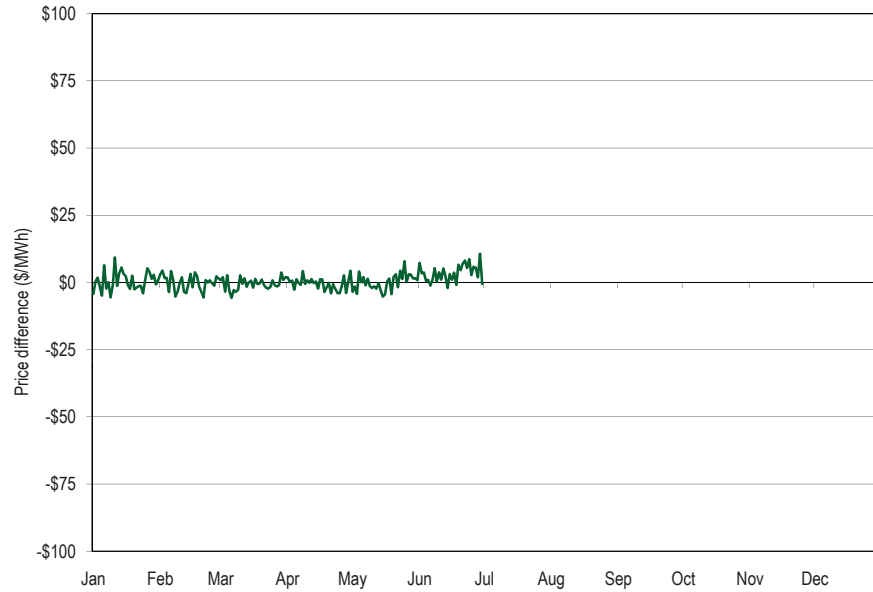


**Table 4-9 Average real-time LMP difference (PJM minus Midwest ISO): January 2008 through June 2010 (See 2009 SOM, Table 4-9)**

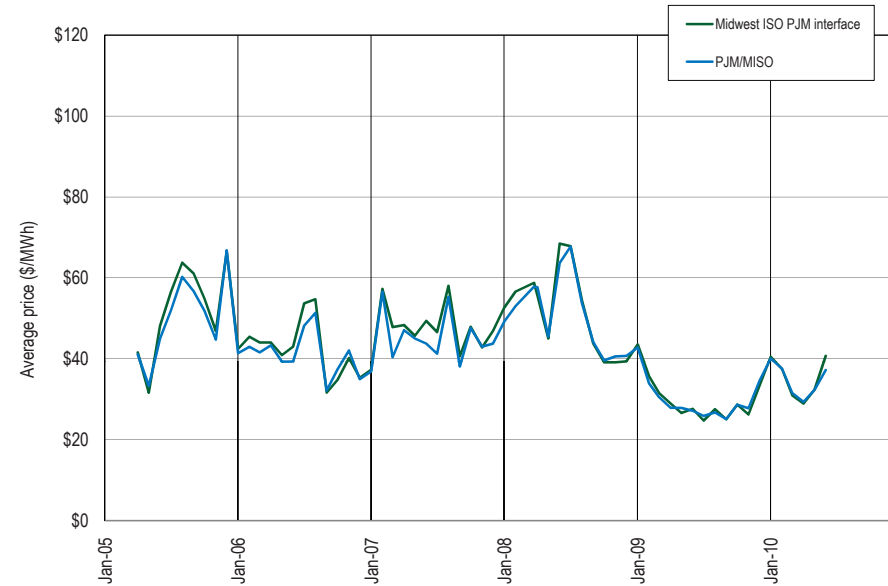
	2008			2009			2010		
	LMP	MCC	MLC	LMP	MCC	MLC	LMP	MCC	MLC
Kincaid (PJM) & Coffeen (MISO)	\$8.26	(\$6.56)	(\$2.86)	\$4.81	(\$2.65)	(\$2.06)	\$2.97	(\$4.89)	(\$2.54)
Beaver Valley (PJM) & Mansfield (MISO)	\$0.89	(\$14.42)	(\$2.38)	\$3.22	(\$4.92)	(\$1.38)	\$1.98	(\$6.64)	(\$1.79)
Miami Fort (PJM) & (MISO)	\$1.25	(\$12.27)	(\$4.16)	\$2.20	(\$4.64)	(\$2.70)	\$1.68	(\$5.48)	(\$3.24)
Stuart (PJM) & (MISO)	\$0.87	(\$12.04)	(\$4.77)	\$1.81	(\$4.63)	(\$3.07)	\$1.57	(\$5.22)	(\$3.62)
PJM/MISO Interface	(\$1.16)	(\$15.34)	(\$3.51)	\$0.01	(\$6.94)	(\$2.58)	(\$0.10)	(\$7.36)	(\$3.14)

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

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



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



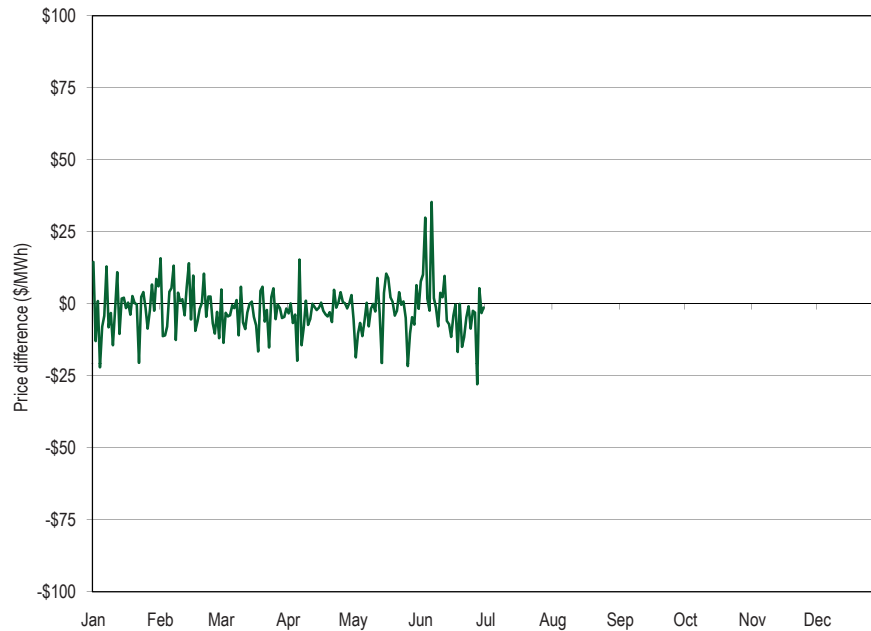
**Table 4-10 Average day-ahead LMP difference (PJM minus Midwest ISO): January 2008 through June 2010 (See 2009 SOM, Table 4-10)**

	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)	\$1.77	(\$4.90)	(\$2.99)
Beaver Valley (PJM) & Mansfield (MISO)	\$3.40	(\$9.88)	(\$3.16)	\$2.48	(\$4.72)	(\$1.67)	\$1.63	(\$5.86)	(\$2.16)
Miami Fort (PJM) & (MISO)	(\$0.05)	(\$11.17)	(\$5.32)	\$1.87	(\$3.85)	(\$3.16)	\$0.66	(\$4.99)	(\$4.00)
Stuart (PJM) & (MISO)	(\$0.56)	(\$11.00)	(\$6.00)	\$1.40	(\$3.87)	(\$3.61)	\$0.32	(\$4.84)	(\$4.49)
PJM/MISO Interface	(\$0.62)	(\$12.51)	(\$4.55)	(\$0.03)	(\$5.75)	(\$3.16)	(\$0.48)	(\$6.28)	(\$3.85)

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

**PJM and NYISO Interface Prices**

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



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

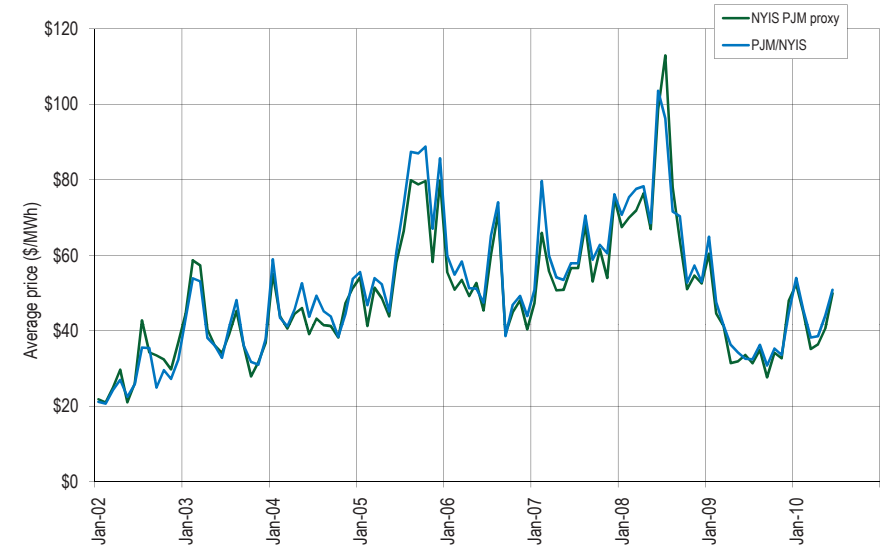


Figure 4-11 Day-ahead daily hourly average price difference (NY proxy - PJM/NYIS): January through June 2010 (See 2009 SOM, Table 4-11)

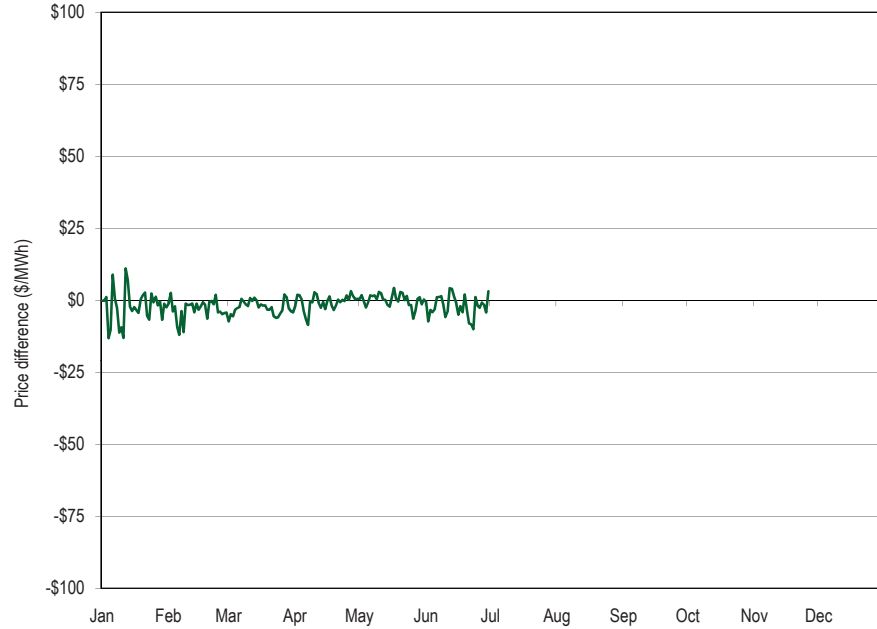
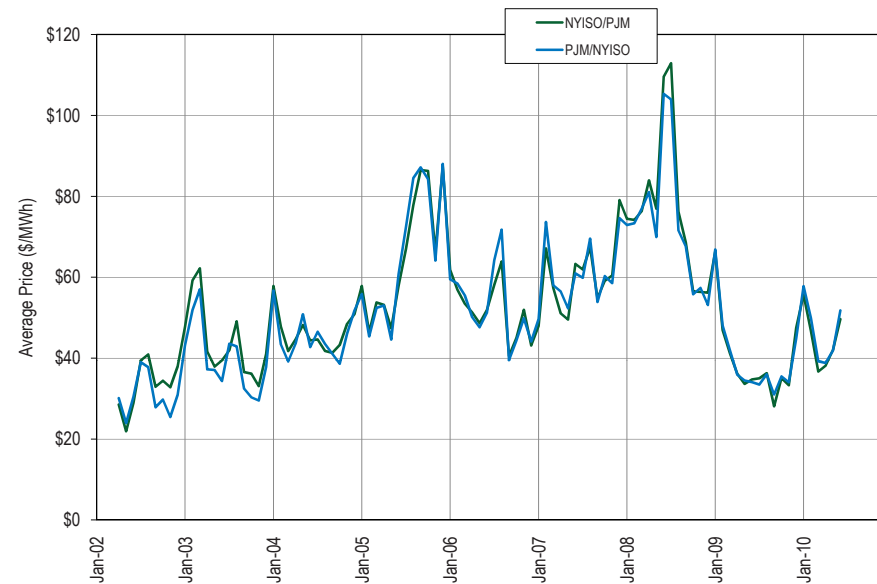
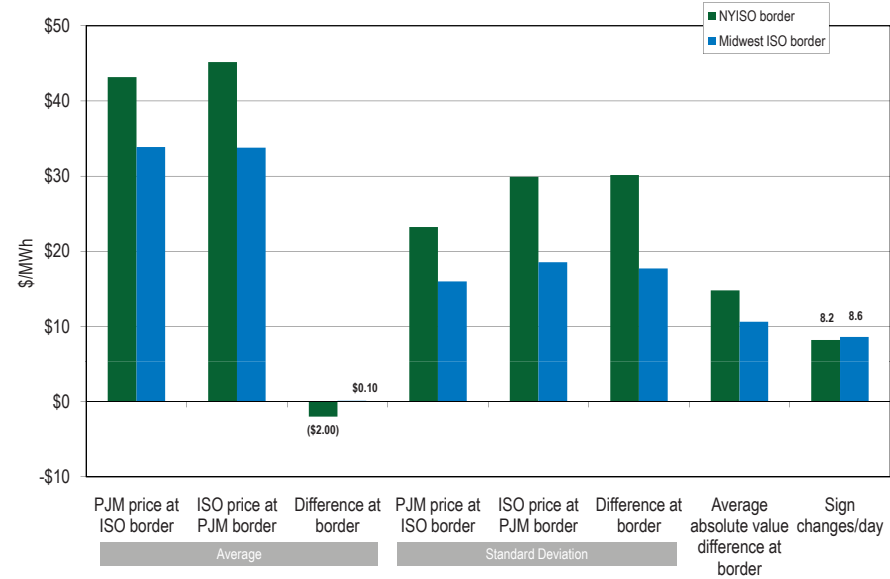


Figure 4-12 Day-ahead monthly hourly average NYISO/PJM proxy bus price and the PJM/NYIS price: January 2002 through June 2010 (See 2009 SOM, Figure 4-12)



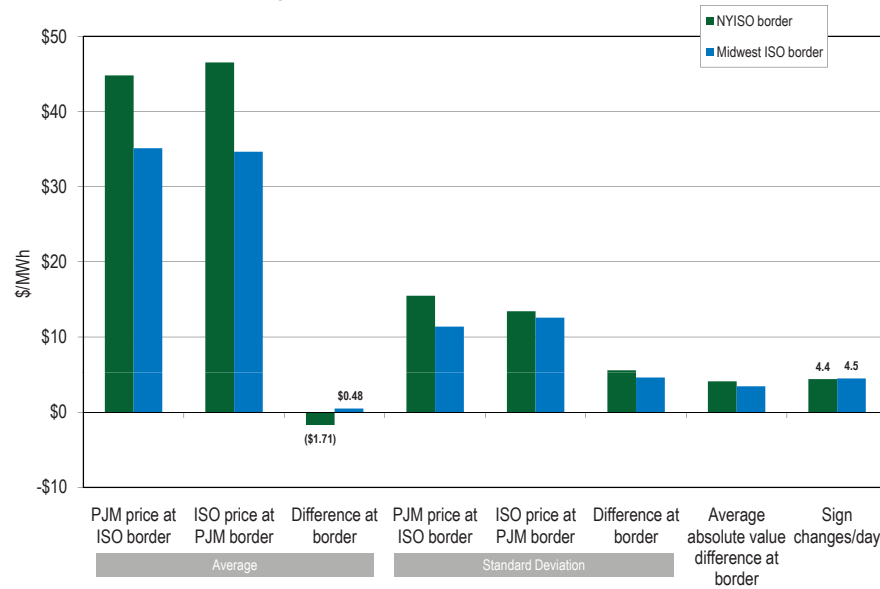
### Summary of Interface Prices between PJM and Organized Markets

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





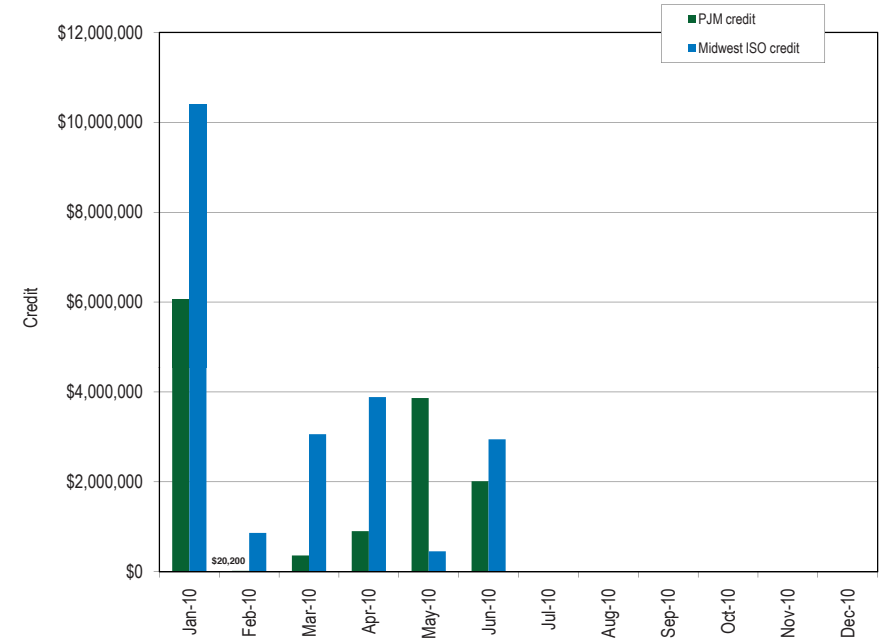
**Figure 4-14 PJM, NYISO and Midwest ISO day-ahead border price averages: January through June 2010 (See 2009 SOM, Figure 4-14)**



**Operating Agreements with Bordering Areas**

**PJM and Midwest ISO Joint Operating Agreement**

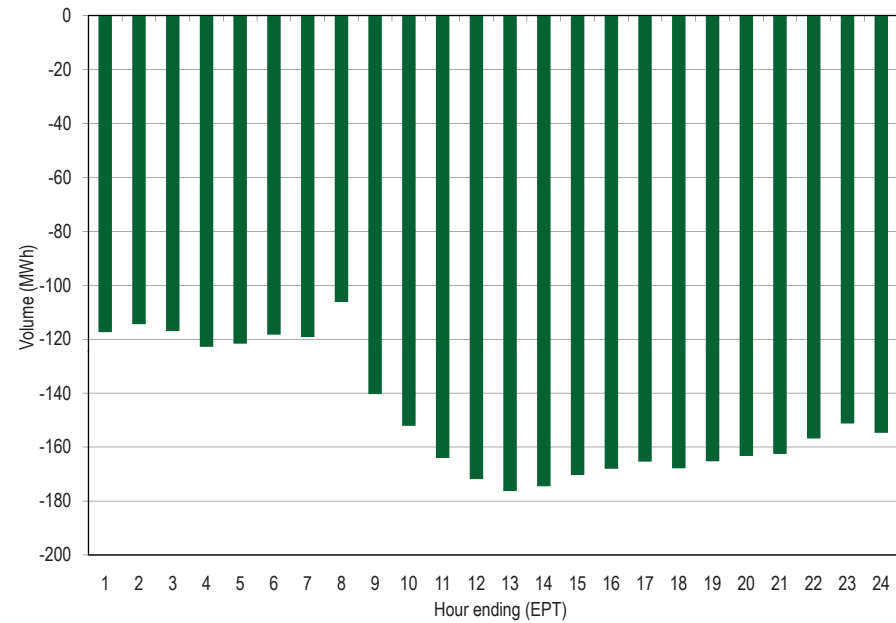
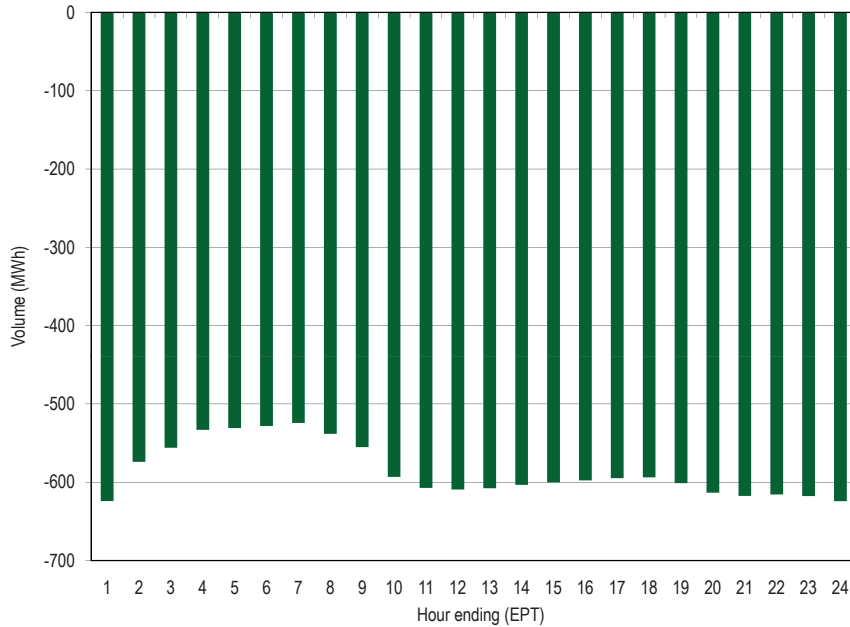
**Figure 4-15 Credits for coordinated congestion management: January through June 2010 (See 2009 SOM, Figure 4-15)**



**Con Edison and PSE&G Wheeling Contracts**

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

	Con Edison			PSE&G		
	Day Ahead	Balancing	Total	Day Ahead	Balancing	Total
Total Congestion Charge	\$2,804,473	(\$21,098)	\$2,783,375	\$4,654,564	\$0	\$4,654,564
Congestion Credit			\$1,569,131			\$4,147,369
Adjustments			\$11,586			\$352,559
Net Charge			\$1,202,658			\$154,636

**Neptune Underwater Transmission Line to Long Island, NY****Linden Variable Frequency Transformer (VFT) facility****Figure 4-16 Neptune hourly average flow: January through June 2010 (See 2009 SOM, Figure 4-16)****Figure 4-17 Linden hourly average flow: January through June 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 June 2010 (See 2009 SOM, Table 4-12)**

	Actual	Scheduled	Net Difference (GWh)	Difference (percent of net scheduled)
CPLE	4,207	(41)	4,248	(10361%)
CPLW	(891)	-	(891)	0%
DUK	(1,350)	265	(1,615)	(609%)
EKPC	175	(126)	301	(239%)
LGEE	624	500	124	25%
MEC	(1,287)	(2,594)	1,307	(50%)
MISO	(3,798)	1,449	(5,247)	(362%)
ALTE	(2,838)	(66)	(2,772)	4200%
ALTW	(991)	(231)	(760)	329%
AMIL	3,148	(303)	3,451	(1139%)
CIN	1,259	2,096	(837)	(40%)
CWLP	(65)	-	(65)	0%
FE	(824)	(1,207)	383	(32%)
IPL	1,561	92	1,469	1597%
MECS	(6,362)	1,305	(7,667)	(588%)
NIPS	(1,152)	(153)	(999)	653%
WEC	2,466	(84)	2,550	(3036%)
NYISO	(5,233)	(7,083)	1,850	(26%)
LIND	(641)	(641)	-	0%
NEPT	(2,545)	(2,545)	-	0%
NYIS	(2,047)	(3,897)	1,850	(47%)
OVEC	3,978	5,834	(1,856)	(32%)
TVA	1,443	(511)	1,954	(382%)
Total	(2,132)	(2,307)	175	(7.6%)

### Loop Flows at PJM's Southern Interfaces

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

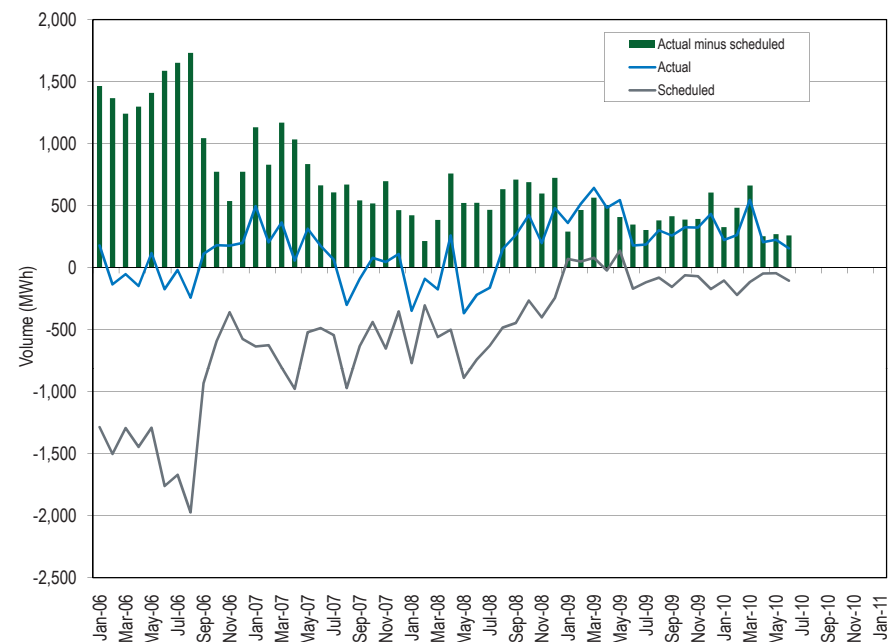


Figure 4-19 Southeast actual and scheduled flows: January 2006 through June 2010 (See 2009 SOM, Figure 4-19)

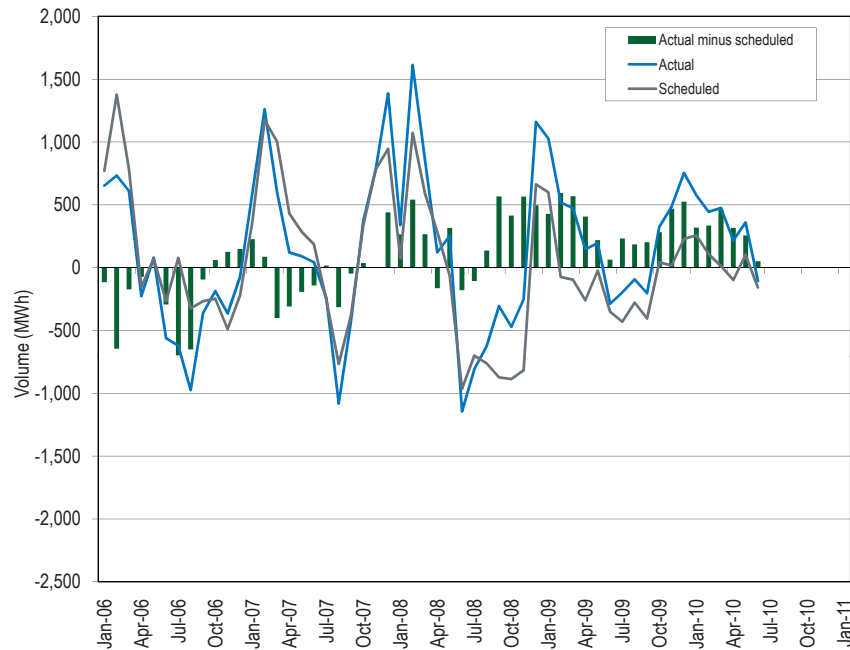


Figure 4-21 Number of different PJM flowgates that experienced TLRs: Calendar year 2009 and January through June 2010 (See 2009 SOM, Figure 4-21)

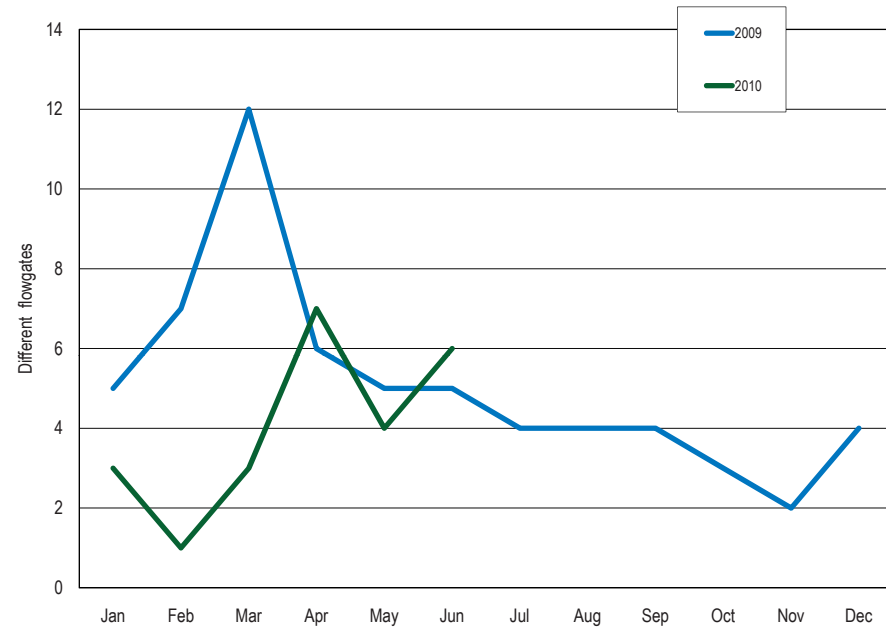
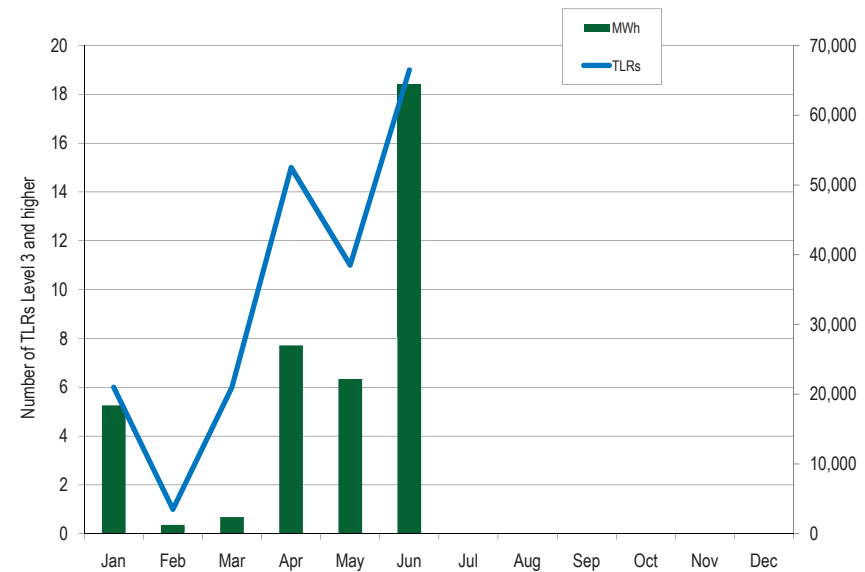
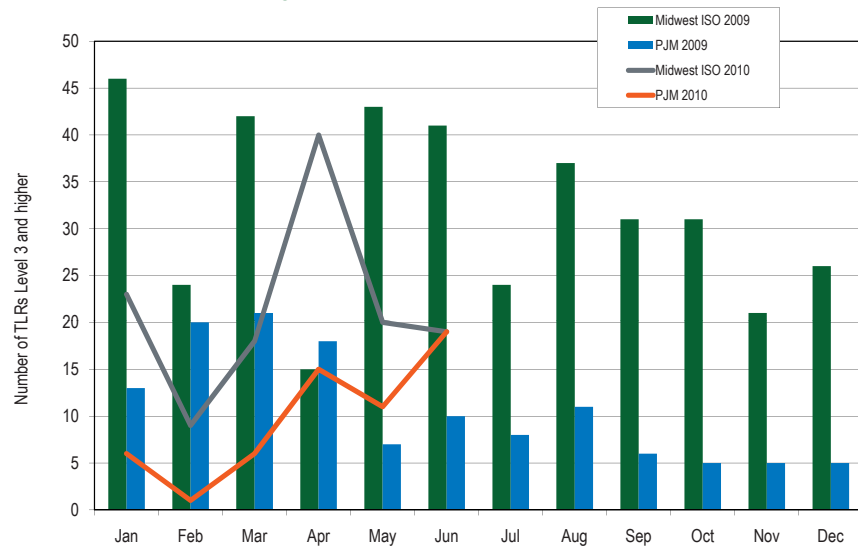


Figure 4-22 Number of PJM TLRs and curtailed volume: January through June 2010 (See 2009, Figure 4-22)



TLRs

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

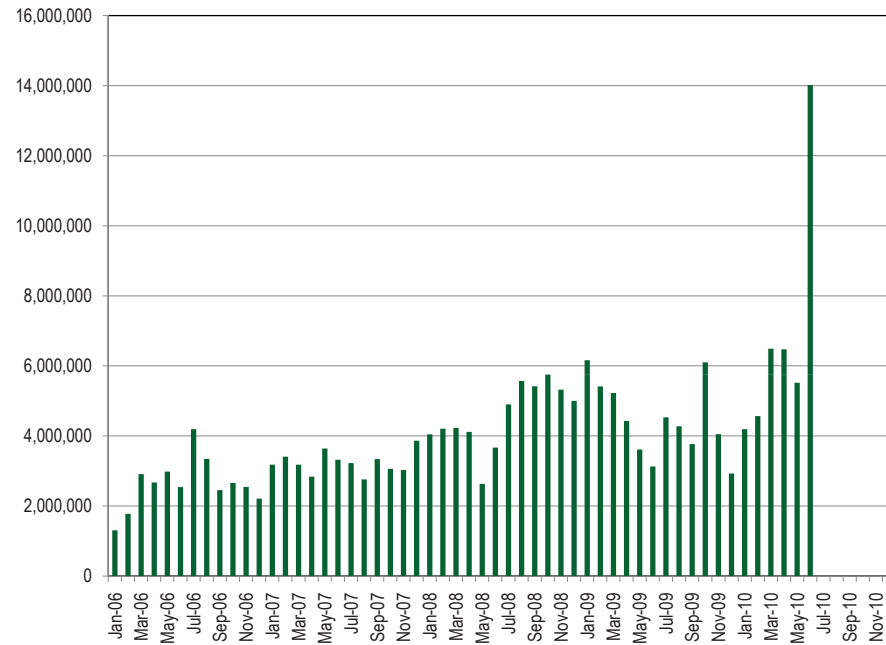


**Table 4-13** Number of TLRs by TLR level by reliability coordinator: January through June 2010 (See 2009 SOM, Table 4-13)

Year	Reliability Coordinator	3a	3b	4	5a	5b	6	Total
2010	ICTE	39	14	65	11	13	0	142
	MISO	73	38	0	10	8	0	129
	NYIS	94	0	0	0	0	0	94
	ONT	44	1	0	0	0	0	45
	PJM	33	25	0	0	0	0	58
	SWPP	96	686	15	25	22	0	844
	TVA	10	13	4	0	1	0	28
	<b>Total</b>	<b>389</b>	<b>777</b>	<b>84</b>	<b>46</b>	<b>44</b>	<b>0</b>	<b>1,340</b>

**Up-To Congestion**

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



**Table 4-14** Up-to congestion MW by Import, Export and Wheels: January 2006 through June 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	19,506,981	20,436,847	1,323,637	41,267,465	47.3%	49.5%	3.2%
<b>TOTAL</b>	<b>89,533,485</b>	<b>124,991,183</b>	<b>5,695,948</b>	<b>220,220,616</b>	<b>40.7%</b>	<b>56.8%</b>	<b>2.6%</b>

**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 June 2010 (See 2009 SOM, Figure 4-24)

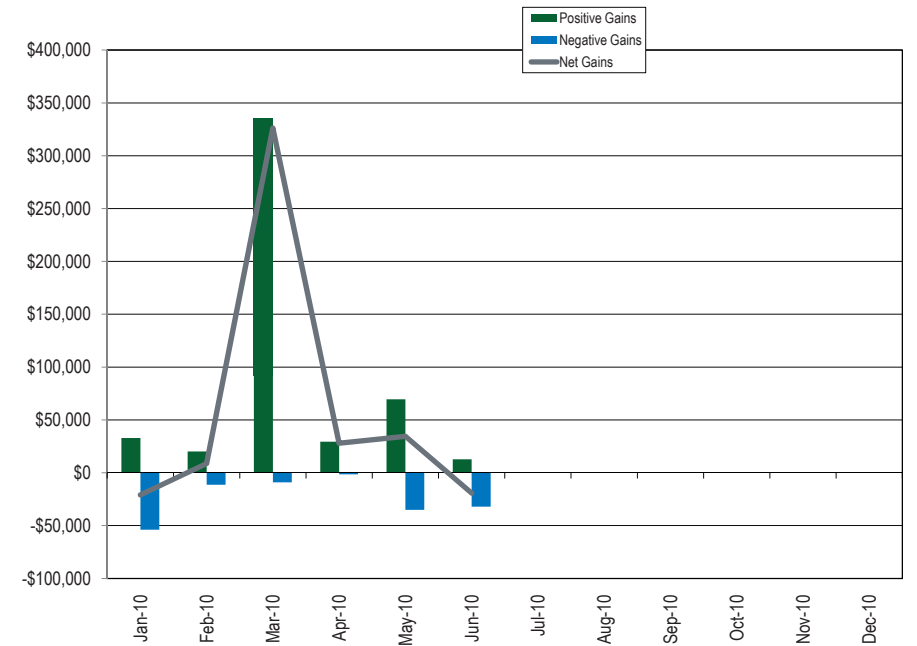


Figure 4-25 Total settlements showing positive, negative and net gains for up-to congestion bids without a matching Real-Time Market transaction: January through June 2010 (See 2009 SOM, Figure 4-25)

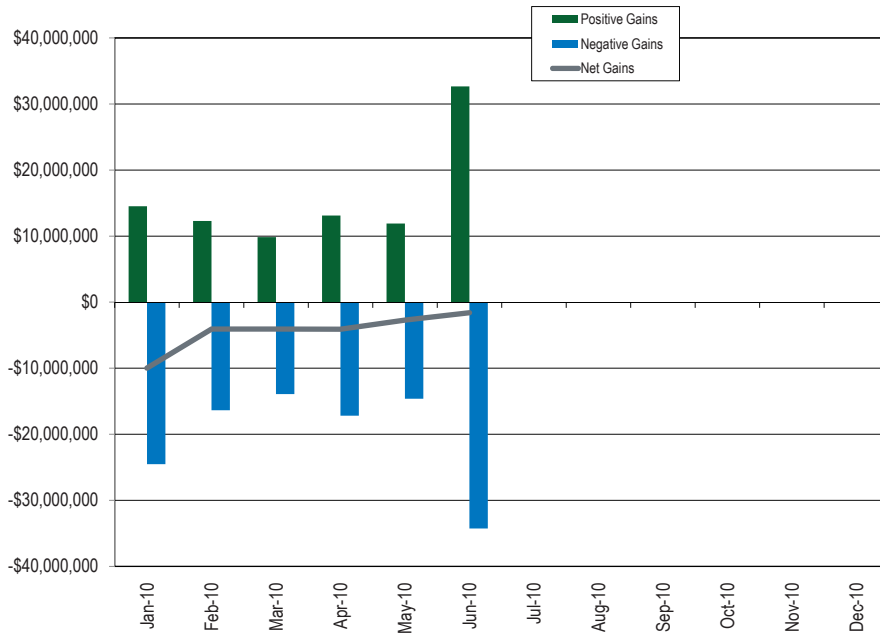


Table 4-16 Real-time average hourly LMP comparison for Duke, PEC and NCMPA: January through June 2010 (See 2009 SOM, Table 4-17)

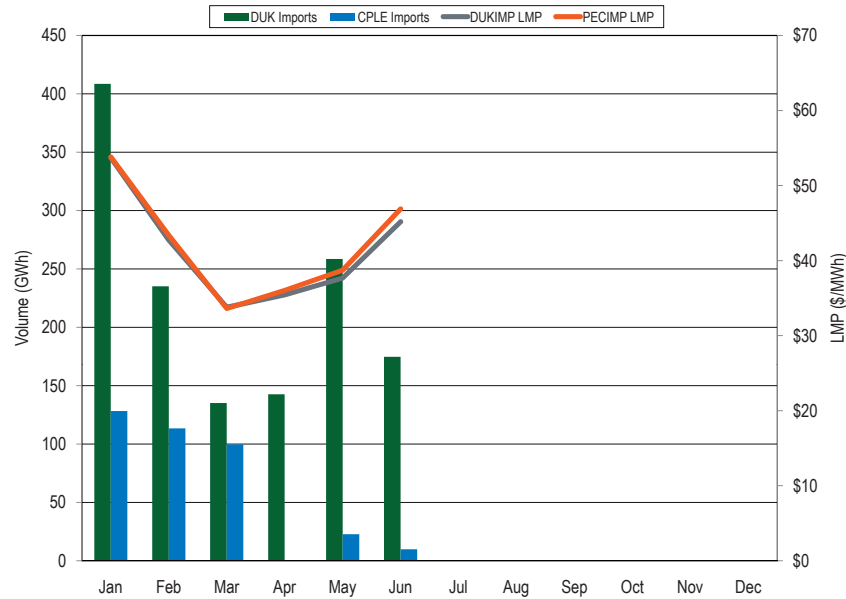
	IMPORT LMP	EXPORT LMP	SOUTHIMP	SOUTHEXP	Difference IMP LMP - SOUTHIMP	Difference EXP LMP - SOUTHEXP
Duke	\$41.35	\$42.18	\$38.98	\$38.99	\$2.36	\$3.19
PEC	\$42.06	\$44.63	\$38.98	\$38.99	\$3.08	\$5.64
NCMPA	\$41.72	\$41.86	\$38.98	\$38.99	\$2.74	\$2.87

Interface Pricing Agreements with Individual Companies

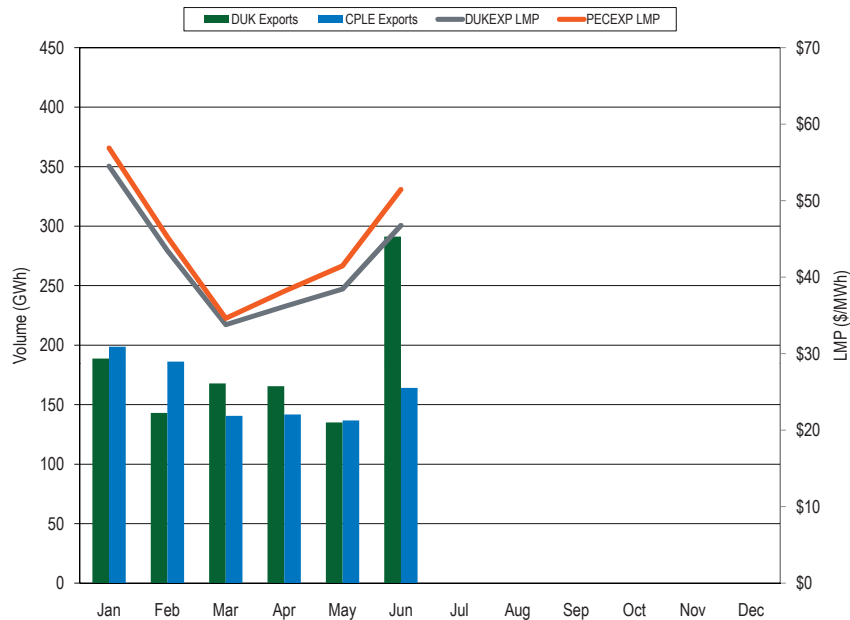
Table 4-15 Real-time average hourly LMP comparison for southeast, southwest, SouthIMP and SouthEXP Interface pricing points: November 1, 2006 through June 2010 (See 2009 SOM, Table 4-15)

	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	\$43.25	\$36.01	\$38.98	\$38.99	\$4.27	(\$2.97)	\$4.26	(\$2.97)

**Figure 4-26 Real-time interchange volume vs. average hourly LMP available for Duke and PEC imports: January through June 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 June 2010 (See 2009 SOM, Figure 4-27)**



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

	IMPORT LMP	EXPORT LMP	SOUTHIMP	SOUTHEXP	Difference IMP LMP - SOUTHIMP	Difference EXP LMP - SOUTHEXP
Duke	\$42.01	\$43.38	\$39.40	\$39.40	\$2.61	\$3.98
PEC	\$43.10	\$45.86	\$39.40	\$39.40	\$3.70	\$6.46
NCMPA	\$42.75	\$42.90	\$39.40	\$39.40	\$3.35	\$3.50

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

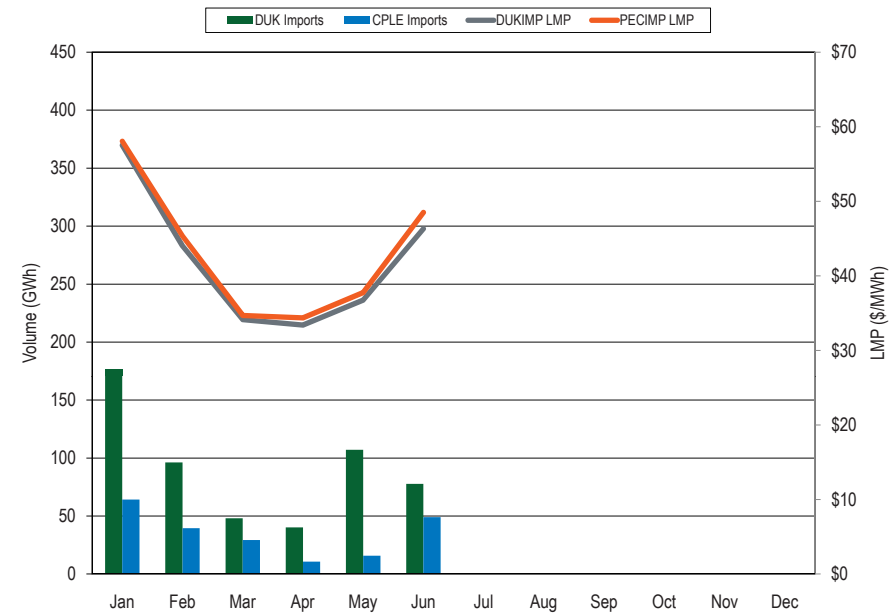
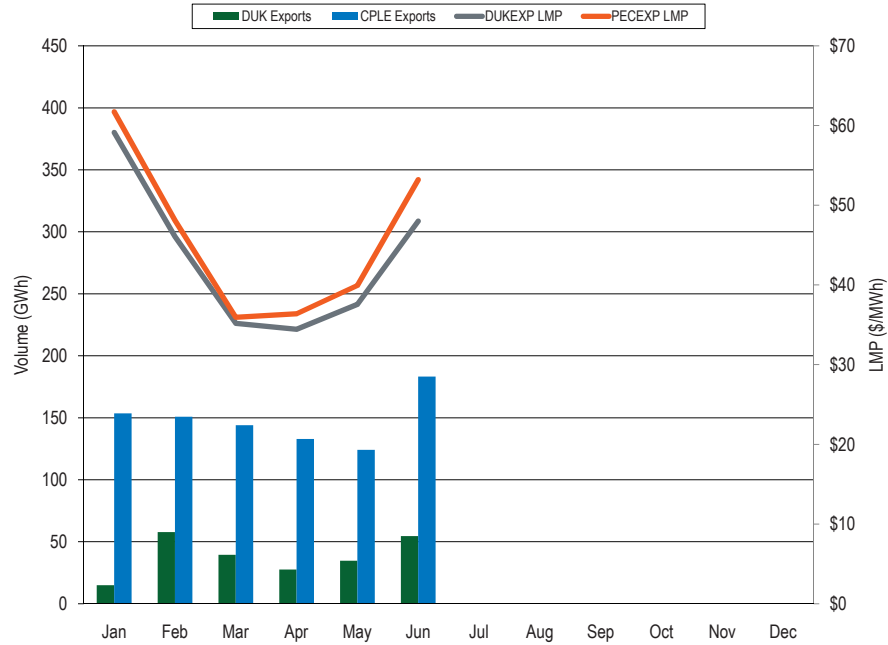
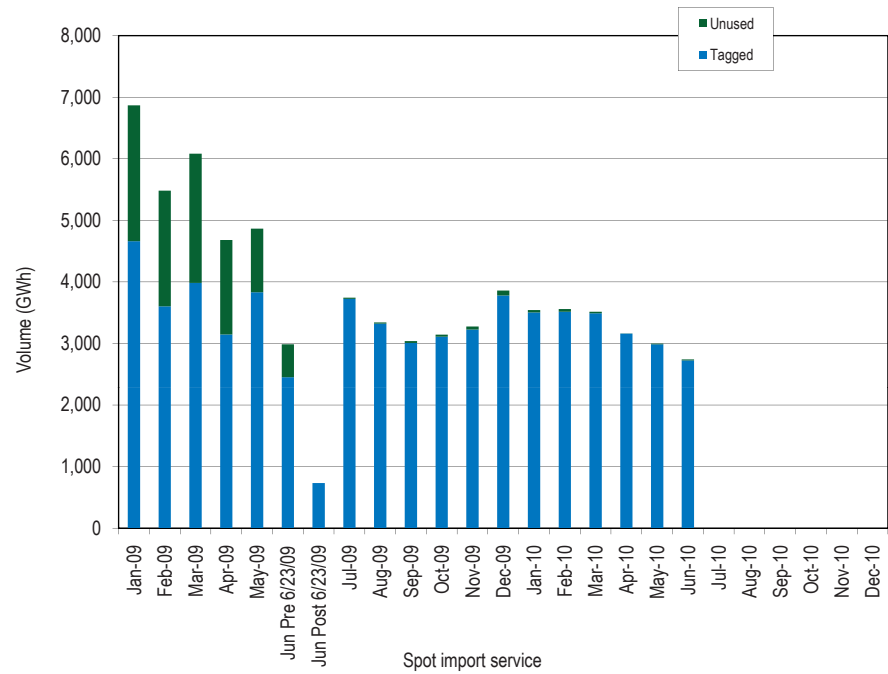


Figure 4-29 Day-ahead interchange volume vs. average hourly LMP available for Duke and PEC exports: January through June 2010 (See 2009 SOM, Figure 4-29)



Spot Import

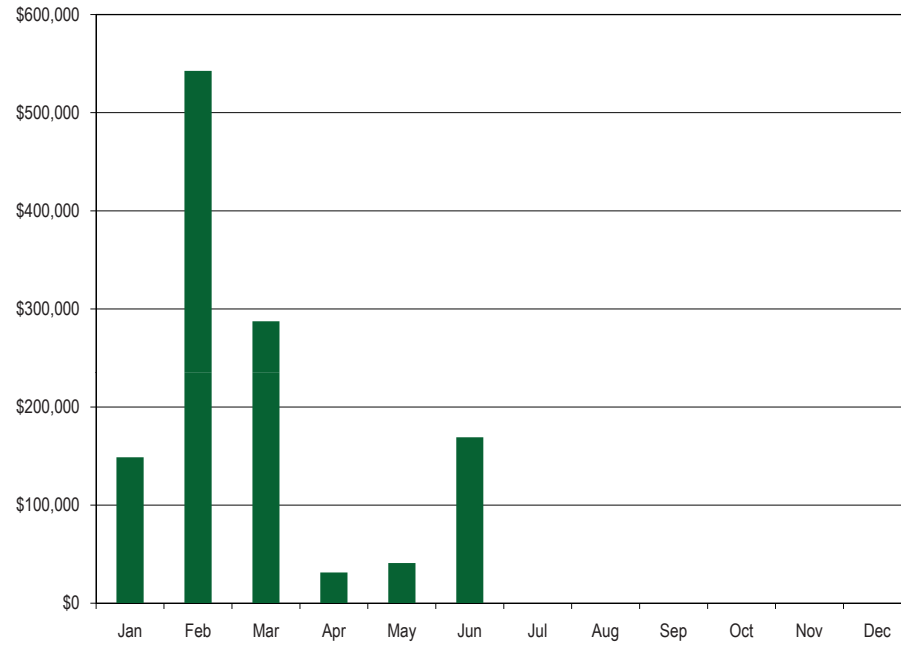
Figure 4-30 Spot import service utilization: January 2009 through June 2010 (See 2009 SOM, Figure 4-30)





### Willing to Pay Congestion and Not Willing to Pay Congestion

Figure 4-31 Monthly uncollected congestion charges: January through June 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 June 2010 (See 2009 SOM, Figure 4-32)

