SECTION 7 – CONGESTION

Congestion occurs when available, least-cost energy cannot be delivered to all loads for a period because transmission facilities are not adequate to deliver that energy to some loads. When the least-cost available energy cannot be delivered to load in a transmission-constrained area, higher cost units in the constrained area must be dispatched to meet that load.[1] The result is that the price of energy in the constrained area is higher than in the unconstrained area because of the combination of transmission limitations and the cost of local generation. Locational marginal prices (LMPs) reflect the price of the lowest-cost resources available to meet loads, taking into account actual delivery constraints imposed by the transmission system. Thus LMP is an efficient way to price energy when transmission constraints exist. Congestion reflects this efficient pricing.

Congestion reflects the underlying features of the power system including the nature and capability of transmission facilities and the cost and geographical distribution of generation facilities. Congestion is neither good nor bad but is a direct measure of the extent to which there are differences in the cost of generation that cannot be equalized because of transmission constraints. A complete set of markets would permit direct competition between investments in transmission and generation. The transmission system provides a physical hedge against congestion. The transmission system is paid for by firm load and, as a result, firm load receives the corollary financial hedge in the form of Auction Revenue Rights (ARRs) and/or Financial Transmission Rights (FTRs). While the transmission system and, therefore, ARRs/FTRs are not guaranteed to be a complete hedge against congestion, ARRs/FTRs do provide a substantial offset to the cost of congestion to firm load.[2]

Analysis of 2006 market results requires comparison to prior years. During calendar years 2004 and 2005, PJM integrated five new control zones. When making comparisons to 2004 and 2005, the *2006 State of the Market Report* refers to three phases in calendar year 2004 and two phases in 2005 that correspond to those integrations.[3]

Overview

Congestion Cost

- **Total Congestion.** Total congestion costs decreased by $489 million or 23 percent, from $2.092 billion in calendar year 2005 to $1.603 billion in calendar year 2006. Day-ahead congestion costs decreased by $650 million or 28 percent, from $2.357 billion in calendar year 2005 to $1.707 billion in calendar year 2006. Balancing congestion costs increased by $161 million or 61 percent, from -$265 million in calendar year 2005 to -$104 million in calendar year in 2006. Total congestion costs have ranged from 7 percent to 10 percent of PJM annual total billings since 2002. Congestion costs were 8 percent of total PJM billings for 2006, compared to 9 percent in 2005. Total PJM billings for 2006 were $20.945 billion, a 7 percent decrease from the $22.630 billion billed in 2005.

1 This is referred to as dispatching units out of economic merit order. Economic merit order is the order of all generator offers from lowest to highest cost. Congestion occurs when loadings on transmission facilities mean that the next unit in merit order cannot be used and that a higher cost unit must be used in its place.

2 See *2006 State of the Market Report*, Volume II, Section 8, "Financial Transmission and Auction Revenue Rights," at "ARR and FTR Revenue and Congestion."

3 For additional information on PJM's footprint and the definition of these phases, see *2006 State of the Market Report*, Volume II, Appendix A, "PJM Geography."

- **Monthly Congestion.** Fluctuations in monthly congestion costs continued to be substantial. In 2006, these differences were driven by varying load and energy import levels, different patterns of generation, weather-induced changes in demand and variations in congestion frequency on constraints affecting large portions of PJM load.

- **Hedged Congestion.** The total of ARR and FTR revenues hedged 99 percent of the congestion costs in the Day-Ahead and Balancing Energy Market within PJM for the 2005 to 2006 planning period and 98.4 percent of the congestion costs in PJM in the first seven months of the 2006 to 2007 planning period.[4] The total value of the hedge provided by FTRs reflects the fact that FTRs were paid at 91 percent of the target allocation level for the 12-month planning period that ended May 31, 2006. FTRs were paid at 100 percent of the target allocation level through December 31, 2006, for the planning period ending May 31, 2007. ARR and FTR revenue adequacy results are aggregate results and all those paying congestion charges were not necessarily hedged at that level as aggregate numbers do not reveal the underlying distribution of FTR holders, their revenues or those paying congestion.

LMP Differentials and Facility or Zonal Congestion

- **LMP Differentials.** To provide an approximate indication of the geographic dispersion of congestion costs, LMP differentials were calculated for control zones in the PJM Mid-Atlantic and Western Regions as they existed at year end as the difference between zonal LMP and the Western Hub LMP. Price separation between eastern and western control zones in PJM was primarily a result of congestion on the Bedington–Black Oak Interface, the Kammer and Wylie Ridge transformers and the 5004/5005 Interface. These constraints generally had the effect of increasing prices in eastern control zones located on the constrained side of the affected facilities while reducing prices in the unconstrained western control zones.

- **Congested Facilities.** As was the case in 2005, congestion frequency was significantly higher in the Day-Ahead as compared to the Real-Time Market in 2006.[5] Day-ahead congestion frequency increased slightly in calendar year 2006 as compared to 2005. In 2006, there were 56,299 day-ahead, congestion-event hours as compared to 55,705 congestion-event hours in 2005. Day-ahead, congestion-event hours increased on lines and Midwest Independent Transmission System Operator, Inc. (Midwest ISO) flowgates, while transformers and interfaces saw decreases. Real-time congestion frequency decreased in calendar year 2006 as compared to 2005. In 2006, there were 19,510 real-time, congestion-event hours as compared to 24,109 congestion-event hours in 2005. Real-time, congestion-event hours increased on Midwest ISO flowgates, while lines, transformers and interfaces saw decreases. The Bedington–Black Oak Interface was the largest contributor to congestion costs in both 2005 and 2006 and, with $492 million in total congestion costs, accounted for 31 percent of the total PJM congestion costs in 2006. The top four constraints in terms of congestion costs together contributed $780 million, or 49 percent, of the total PJM congestion costs in 2006. The top four constraints also included the 5004/5005 Interface, Mount Storm–Pruntytown and Kanawha–Matt Funk lines.

4 See *2006 State of the Market Report*, Volume II, Section 8, "Financial Transmission and Auction Revenue Rights," at Table 8-20, "ARR and FTR congestion hedging: Planning periods 2005 to 2006 and 2006 to 2007."

5 Prior state of the market reports measured real-time congestion frequency using the convention that a congestion-event hour exists if the particular facility is constrained for four or more of the 12 five-minute intervals comprising that hour. In the *2006 State of the Market Report*, in order to have a consistent metric for real-time and day-ahead congestion frequency, real-time congestion frequency is measured using the convention that an hour is constrained if any of its component five-minute intervals is constrained. Comparisons to previous periods use the new standard for both current and prior periods.

- **Zonal Congestion.** In calendar year 2006, the AP Control Zone experienced the highest congestion cost of any control zone in PJM. The $340 million in congestion costs in the AP Control Zone represented a 26 percent decrease from the $460 million in congestion costs the zone had experienced in 2005. The Bedington–Black Oak Interface and Meadow Brook transformer constraints together contributed $208 million, or 61 percent of the total AP Control Zone congestion cost. The AEP Control Zone had the second highest congestion cost in PJM in 2006. The $242 million in congestion costs in the AEP Control Zone represented an 18 percent increase from the $204 million in congestion costs the zone had experienced in 2005. The Kanawha–Matt Funk line and the Bedington–Black Oak Interface constraints together contributed $104 million, or 43 percent of the total AEP Control Zone congestion cost.

Economic Planning Process

- **Process Revision.** PJM's current planning process for economic transmission expansions provides that when unhedgeable congestion reaches certain thresholds, a one-year market window is opened during which time market solutions may be proposed by market participants. In its September 8, 2006, filing, PJM proposed to replace the unhedgeable congestion approach with an evaluation based on additional congestion metrics. The metrics will be applied to evaluating all types of transmission projects, including whether to modify or accelerate reliability enhancements already in the Regional Transmission Expansion Plan (RTEP) that could also relieve one or more economic constraints and whether to propose new, economic transmission projects that could relieve one or more economic constraints. PJM will also evaluate whether demand response resources or new generation could eliminate the need for an economic upgrade. The revised economic planning process includes enhanced stakeholder participation. The proposed economic planning revisions incorporate improvements over the existing process but require ongoing development. The approach to weighting and evaluating the metrics in the context of actual transmission projects will require substantial effort. New transmission projects, and the lack of existing transmission, can have significant impacts on the PJM markets and the goal of transmission planning should ultimately be the incorporation of transmission investment decisions into market-driven processes as much as is practicable.

Conclusion

Congestion reflects the underlying characteristics of the power system, including the nature and capability of transmission facilities and the cost and geographical distribution of generation facilities. Total congestion costs decreased by $489 million or 23 percent, from $2.092 billion in calendar year 2005 to $1.603 billion in calendar year 2006. Day-ahead congestion costs decreased by $650 million or 28 percent, from $2.357 billion in calendar year 2005 to $1.707 billion in calendar year 2006. Balancing congestion costs increased by $161 million or 61 percent, from -$265 million in calendar year 2005 to -$104 million in calendar year in 2006. Congestion costs were significantly higher in the Day-Ahead Market than in the Balancing Market. Congestion frequency was also significantly higher in the Day-Ahead Market than in the Real-Time Market. In the Day-Ahead Market in 2006, there were 56,299 congestion-event hours compared to 55,705 congestion-event hours in 2005. In the Real-Time Energy Market in 2006, there were 19,510 congestion-event hours compared to 24,109 congestion-event hours in 2005.

As a result of the geographic growth of PJM, efficient redispatch displaced the less efficient management of borders via transmission loading relief (TLR) procedures and ramp limits. Redispatch is more efficient and, at the same time, revealed the underlying inability of the transmission system to transfer the lowest-cost energy on the system to all parts of the system for all hours. The details are revealed in the analysis of temporal patterns of congestion and of congested facilities and zonal congestion. That information, made explicit over the broad PJM footprint for the first time, is an essential input to a rational market and planning process. PJM has made significant steps in the transmission planning process.

ARRs and FTRs served as an effective hedge against congestion. In total, ARR and FTR revenues hedged 99 percent of congestion costs in the Day-Ahead and Balancing Energy Market within PJM for the 2005 to 2006 planning period and 98.4 percent of the congestion costs in PJM in the first seven months of the 2006 to 2007 planning period. FTRs were paid at 91 percent of their target allocation for the planning year ended May 31, 2006, and at 100 percent for the first seven months of the current planning year.

One constraint accounted for almost a third of total congestion costs in 2006 and the top four constraints accounted for about half of total congestion costs. The largest constraint has been a persistent source of large congestion costs for several years. This suggests that these constraints should receive special attention in the economic planning process. The Bedington–Black Oak Interface was the largest contributor to congestion costs in both 2005 and 2006 and, with $492 million in total congestion costs, accounted for 31 percent of the total PJM congestion costs in 2006. The top four constraints in terms of congestion costs together accounted for 49 percent of the total PJM congestion costs in 2006.

Congestion

Congestion Accounting

Transmission congestion can exist in PJM's Day-Ahead and Real-Time Energy Market. Transmission congestion charges in the Day-Ahead Energy Market can be directly hedged by FTRs. Balancing Market congestion charges can be hedged by FTRs to the extent that a participant's energy flows in real time are consistent with those in the Day-Ahead Energy Market.[6]

Total congestion charges are the sum of the implicit, explicit and spot market congestion charges incurred in the Day-Ahead Market and the Balancing Market, minus any negatively valued FTR target allocations.[7]

- **Implicit Congestion Charges.** Implicit congestion charges are the net congestion charges to serve load from owned generation and contractual energy purchases. These charges are incurred by network service customers in delivering their own generation or bilateral purchases to their load and equal the difference between a participant's load charges and generation credits, less the participant's spot market bill. In the Day-Ahead Energy Market, load charges are calculated as the sum of the demand at every bus times the bus LMP. Demand includes load, decrement bids and sale transactions. Generation credits in the Day-Ahead Energy Market are calculated as the sum of the supply at every bus times the bus LMP, where supply includes generation, increment bids and purchase transactions. In the Balancing

6 The terms "congestion charges" and "congestion costs" are both used to refer to the costs associated with congestion. The term "congestion charges" is used in PJM Settlements documents.

7 See PJM "Manual 28: Operating Agreement Accounting," Revision 36 (January 1, 2007), p. 42.

Energy Market, load charges and generation credits are calculated using the differences between day-ahead and real-time demand and supply and valuing congestion using real-time LMP.

- **Explicit Congestion Charges.** Explicit congestion charges are the net congestion charges associated with point-to-point energy transactions. These charges equal the product of the transacted MW and LMP differences between sources (origins) and sinks (destinations) in the Day-Ahead Energy Market. Balancing Energy Market explicit congestion charges equal the product of the differences between the real-time and day-ahead transacted MW and the differences between the real-time LMP at the transactions' sources and sinks.

- **Spot Market Congestion Charges**. Spot congestion charges are the net congestion charges associated with spot market purchases and sales. These charges equal the difference between total spot market purchase payments and total spot market sales revenues.

The congestion charges associated with specific constraints are the sum of the total day-ahead and balancing congestion costs associated with those constraints. The congestion charges in each zone are the sum of the congestion charges associated with each constraint that affects prices in the zone. The network nature of the transmission system means that congestion costs in a zone are frequently the result of constrained facilities located outside that zone. In prior state of the market reports, the analysis of specific constraints focused on real-time congestion frequency.[8]

Congestion costs can be both positive and negative. Congestion is defined with respect to the system marginal price (SMP), which is the single system price that would occur in the absence of any congestion. When a transmission constraint occurs, congestion is positive on one side of the constraint and negative on the other side of the constraint and the corresponding congestion component of LMP (CLMP) is positive or negative. The CLMP measures the difference between the actual LMP that results from transmission constraints and the unconstrained SMP. If an area experiences lower prices because of a constraint, the CLMP in that area is negative.

Total Calendar Year Congestion

While congestion charges are the primary source of funding to meet FTR target allocations, they are only a part of total FTR funding. Annual congestion charges may be greater than, less than, or equal to, total FTR revenues depending upon adjustments made to total FTR revenues. A year-to–year comparison of congestion charges and total FTR revenues shows that congestion charges were greater than FTR revenues in 2002 and less than FTR revenues in 2003 through 2006. (See Table 7-1 and Table 7-2.) Table 7-3 shows the detailed components of FTR revenues including congestion charges and other adjustments for calendar year 2006.

Table 7-1 shows that FTR revenues have ranged from 7 percent to 10 percent of total, annual PJM billings since 2002. Annual FTR revenues decreased by 23 percent in 2006 and were 8 percent of total PJM billings in 2006. [9, 10]

8 The MMU has developed new analytical tools that permit the analysis of congestion cost by zone and constraint in this report.

9 Calculated values shown in Section 7, "Congestion," are based on unrounded, underlying data and may differ from calculations based on the rounded values in the tables.

10 FTR revenue data may be adjusted by the PJM Settlements Department after the publication of the state of the market report. The data here are current for 2006 and final for prior years.

Table 7-1 Total annual PJM FTR revenues [Dollars (millions)]: Calendar years 2002 to 2006

	FTR Revenues	Percent Change	Total PJM Billing	Percent of PJM Billing
2002	$430	NA	$4,700	9%
2003	$499	16%	$6,900	7%
2004	$808	62%	$8,700	9%
2005	$2,158	167%	$22,630	10%
2006	$1,653	(23%)	$20,945	8%
Total	$5,547		$63,875	9%

Congestion charges are comprised of hourly congestion revenue and net negative congestion. Congestion charges have ranged from 7 percent to 10 percent of annual total PJM billings since 2002. Congestion charges decreased by 23 percent in 2006 as compared to 2005 and were equal to 8 percent of total PJM billings in 2006. Table 7-2 shows total congestion by year from 2002 through 2006. Total congestion charges were $1.60 billion in calendar year 2006, a 23 percent decrease from $2.09 billion in calendar year 2005.

Table 7-2 Total annual PJM congestion [Dollars (millions)]: Calendar years 2002 to 2006

	Congestion Charges	Percent Change	Total PJM Billing	Percent of PJM Billing
2002	$453	NA	$4,700	10%
2003	$464	2%	$6,900	7%
2004	$750	62%	$8,700	9%
2005	$2,092	179%	$22,630	9%
2006	$1,603	(23%)	$20,945	8%
Total	$5,362		$63,875	8%

Table 7-3 shows the composition of FTR target allocations and FTR revenues for calendar year 2006. FTR targets are composed of FTR target allocations and associated adjustments. Other adjustments may be made for items such as modeling changes or errors.

FTR revenues are primarily comprised of hourly congestion revenue and net negative congestion. FTR revenues also include ARR excess which is the difference between ARR target allocations and FTR auction revenues. Competing use revenues are based on the Unscheduled Transmission Service Agreement between the New York Independent System Operator (NYISO) and PJM. This agreement sets forth the terms and conditions under which compensation is provided for transmission service in connection with transactions not scheduled directly or otherwise prearranged between NYISO and PJM. Total congestion charges appearing in Table 7-2 include both congestion charges associated with PJM facilities and those associated with reciprocal, coordinated flowgates in the Midwest ISO whose operating limits are respected

by PJM.[11] The operating protocol governing the wheeling contracts between Public Service Electric and Gas Company (PSE&G)[12] and Consolidated Edison Company of New York (Con Edison) resulted in a reimbursement of $2 million in congestion charges to Con Edison in calendar year 2006.[13, 14]

Table 7-3 Total annual PJM FTR revenue detail [Dollars (millions)]: Calendar year 2006

Accounting Element	
ARR Information	
ARR Target Allocations	$1,183.6
FTR Auction Revenue	$1,210.9
ARR Excess	$27.4
FTR Targets	
FTR Target Allocations	$1,676.9
Adjustments:	
Adjustments to FTR Target Allocations	($1.6)
Total FTR Targets	$1,675.3
FTR Revenues	
ARR Excess	$27.4
Competing Uses	$1.2
Hourly Congestion Revenue	
Day-Ahead	$1,707.1
Balancing	($103.8)
Midwest ISO M2M (Credit to PJM Minus Credit to Midwest ISO)	$2.5
CEPSW Wheel Congestion Credit	($2.0)
Adjustments:	
Excess Revenues Carried Forward Into Future Months	$15.3
Excess Revenues Distributed Back to Previous Months	$6.6
Other Adjustments to FTR Revenues	($1.5)
Total FTR Revenues	$1,652.5
Excess Revenues Distributed to Other Months	($40.1)
Excess Revenues Distributed to Firm Demand Holders	$0.0
Total FTR Congestion Credits	$1,612.4
Total Congestion Credits on Bill (Includes CEPSW & End-of-Year Distribution)	$1,614.4
Remaining Deficiency	$62.9

11 See "Joint Operating Agreement between the Midwest Independent System Operator, Inc. and PJM Interconnection, L.L.C." (December 31, 2003), Substitute Original Sheet No. 66 <http://www.pjm.com/documents/downloads/agreements/joa-complete.pdf> (1,331 KB).

12 Prior state of the market reports indicated that this contract is an agreement between Con Edison and PSEG. The contract is between Con Edison and PSE&G, a wholly owned subsidiary of PSEG.

13 111 FERC ¶ 61,228 (2005).

14 See *2006 State of the Market Report*, Volume II, Section 4, "Interchange Transactions," at "Con Edison and PSE&G Wheeling Contracts 2006 Update."

Monthly Congestion

Table 7-4 shows that during calendar year 2006, monthly congestion charges ranged from a maximum of $376 million in August 2006 to a minimum of $41 million in October 2006.

Table 7-4 Monthly PJM congestion revenue statistics [Dollars (millions)]: Calendar years 2005 to 2006

	Maximum	Mean	Median	Minimum	Range
2005	$334	$174	$161	$57	$277
2006	$376	$134	$92	$41	$335

Approximately 28 percent of all calendar year 2006 congestion occurred in the high-demand months of July and January.

Hedged Congestion

Table 7-5 lists FTR revenues, target allocations, credits, payout ratios, congestion credit deficiencies and excess congestion charges by month. At the end of the 12-month planning period, excess congestion charges are used to offset any monthly congestion credit deficiencies. PJM is currently in a 12-month planning period that began on June 1, 2006, and will end on May 31, 2007.

Table 7-5 Monthly PJM congestion accounting summary [Dollars (millions)]: By planning period

		FTR Revenues	FTR Target Allocations	FTR Credits	FTR Payout	Credits Deficiency	Credits Excess
Plannnig Year 2005 to 2006	Jun-05	$181	$187	$181	97%	$6	$0
	Jul-05	$320	$326	$320	98%	$6	$0
	Aug-05	$335	$336	$335	100%	$2	$0
	Sep-05	$227	$259	$227	87%	$33	$0
	Oct-05	$228	$280	$228	81%	$53	$0
	Nov-05	$110	$143	$110	77%	$33	$0
	Dec-05	$284	$315	$284	90%	$31	$0
	Jan-06	$160	$150	$150	100%	$0	$10
	Feb-06	$159	$171	$159	93%	$12	$0
	Mar-06	$94	$127	$94	74%	$33	$0
	Apr-06	$51	$65	$51	78%	$14	$0
	May-06	$72	$76	$72	94%	$4	$0
	Total	$2,219	$2,436	$2,219	91%	$217	$0
		Values After Excess Revenues Distributed					
		$2,219	$2,436	$2,219	91%	$217	$0
Planning Year 2006 to 2007 (through December 31, 2006)	Jun-06	$168	$168	$168	100%	$0	$0
	Jul-06	$298	$294	$294	100%	$0	$5
	Aug-06	$374	$368	$368	100%	$0	$6
	Sep-06	$79	$75	$75	100%	$0	$4
	Oct-06	$47	$45	$45	100%	$0	$2
	Nov-06	$50	$44	$44	100%	$0	$6
	Dec-06	$101	$92	$92	100%	$0	$9
	Total	$1,117	$1,086	$1,086	100%	$0	$31

FTRs were paid at 91 percent of the target allocation level for the 12-month planning period that ended May 31, 2006. FTRs for the planning period ending May 31, 2007, have been paid at 100 percent of the target allocation level through December 31, 2006.

The total of ARR and FTR revenues hedged 99 percent of the congestion costs in the Day-Ahead and Balancing Energy Market within PJM for the 2005 to 2006 planning period and 98.4 percent of the congestion costs in PJM in the first seven months of the 2006 to 2007 planning period. The ARR and FTR revenue adequacy results are aggregate results and all those paying congestion charges were not necessarily hedged at that level. Aggregate numbers do not reveal the underlying distribution of FTR holders, their revenues or those paying congestion.

LMP Differentials

LMP differentials were calculated for each PJM control zone, to provide an approximate indication of the geographic dispersion of congestion costs. LMP differentials for control zones are presented in Table 7-6 for calendar years 2005 and 2006 and were calculated as the difference between zonal LMP and the Western Hub LMP.

Table 7-6 shows overall congestion patterns in 2006. Price separation between eastern and western control zones in PJM was primarily a result of congestion on the Bedington–Black Oak Interface, the Kammer and Wylie Ridge transformers and the 5004/5005 Interface. These constraints generally had the effect of increasing prices in eastern control zones located on the constrained side of the affected facilities while reducing prices in the unconstrained western control zones.

Table 7-6 Annual average zonal LMP differentials [Reference to Western Hub (Dollars per MWh)]: Calendar years 2005 to 2006

Control Zone	2005		2006	
	Day Ahead	Real Time	Day Ahead	Real Time
AECO	$8.42	$7.07	$4.53	$4.42
AEP	($12.53)	($13.74)	($8.65)	($8.87)
AP	($2.38)	($2.89)	($2.72)	($2.41)
BGE	$6.36	$6.83	$5.46	$6.29
ComEd	($13.58)	($14.59)	($9.00)	($9.60)
DAY	($13.69)	($15.15)	($9.72)	($9.90)
DLCO	($15.33)	($17.42)	($11.08)	($11.78)
Dominion	$4.03	$5.11	$4.53	$5.32
DPL	$6.54	$4.54	$2.94	$1.98
JCPL	$5.26	$4.56	$1.18	$0.68
Met-Ed	$4.38	$3.15	$2.59	$1.55
PECO	$6.26	$4.34	$2.41	$1.29
PENELEC	($3.78)	($4.54)	($3.96)	($4.48)
PEPCO	$7.72	$8.01	$6.73	$7.73
PPL	$3.61	$1.96	$1.44	$0.40
PSEG	$8.04	$8.73	$3.64	$3.46
RECO	$5.78	$6.52	$3.58	$2.77

Congested Facilities

A congestion event exists when a unit or units must be dispatched out of merit order to control the impact of a contingency on a monitored facility or to control an actual overload. A congestion-event hour exists when a specific facility is constrained for one or more five-minute intervals within an hour. A congestion-event hour differs from a constraint hour, which is any hour during which one or more facilities are congested. Thus, if two facilities are constrained during an hour, the result is two congestion-event hours and one constraint hour. Constraints are often simultaneous, so the number of congestion-event hours exceeds the number of constraint hours and the number of congestion-event hours can exceed the number of hours in a year. In order to have a consistent metric for real-time and day-ahead congestion frequency, real-time congestion frequency is measured using the convention that an hour is constrained if any of its component five-minute intervals is constrained. This is also consistent with the way in which PJM reports real-time congestion. Prior state of the market reports measured real-time congestion frequency using the convention that a congestion-event hour exists if the particular facility is constrained for four or more of the 12 five-minute intervals comprising that hour. In 2006, there were 56,299 day-ahead, congestion-event hours, a slight increase from the 55,705 in 2005. In 2006, there were 19,510 real-time, congestion-event hours, a 19 percent decrease from 24,109 in 2005.

Congestion by Facility Type and Voltage

Both day-ahead and balancing congestion-event hours increased on the Midwest ISO flowgates in 2006. Day-ahead congestion-event hours increased on lines while real-time congestion-event hours decreased on lines. Both day-ahead and balancing congestion-event hours decreased on transformers and interfaces.

Day-ahead congestion costs decreased on all facility types in 2006 except unclassified.[15] Balancing congestion costs decreased on the Midwest ISO flowgates in 2006 and increased on all other facility types.

Table 7-7 provides congestion-event-hour subtotals and congestion cost subtotals comparing calendar year results by facility type: line, transformer, interface, flowgate and unclassified facilities.[16]

Total congestion costs associated with Midwest ISO flowgates decreased by $21.2 million, or 139 percent, from $15.2 million in 2005 to -$6.0 million in 2006. The Pierce and Rising flowgates together accounted for $0.8 million in congestion costs and were the largest contributors to positive congestion costs among Midwest ISO flowgates in 2006. The largest contribution to negative congestion costs among Midwest ISO flowgates came from the State Line–Wolf Lake flowgate with -$4.4 million in 2006 congestion costs.

Total congestion costs associated with interfaces decreased 25 percent from $1,023 million in 2005 to $764 million in 2006. Interfaces typically include multiple transmission facilities and reflect power flows into or through a wider geographic area. Interface congestion constituted 48 percent of total PJM congestion costs in 2006. Among interfaces, the Bedington–Black Oak and 5004/5005 Interfaces accounted for the

15 Unclassified constraints appear in the Day-Ahead Market only and represent congestion costs incurred on market elements which are not posted by PJM. Congestion frequency associated with these unclassified constraints is not presented in order to be consistent with the posting of constrained facilities by PJM.

16 The term "flowgate" refers to Midwest ISO flowgates in this context.

largest contribution to positive congestion costs in 2006. Bedington–Black Oak, with $492 million in congestion, had the highest congestion cost of any facility in PJM, accounting for 31 percent of the total PJM congestion costs in 2006. The Bedington–Black Oak and 5004/5005 Interfaces together accounted for $598 million or 37 percent of total PJM congestion costs in 2006. The largest contribution to negative congestion costs among interface constraints was the PL North Interface with -$0.06 million in 2006.[17]

Total congestion costs associated with lines decreased 2 percent from $504 million in 2005 to $496 million in 2006. Line congestion accounted for 31 percent of the total PJM congestion costs for 2006. The Cloverdale–Lexington, Kanawha–Matt Funk and Mount Storm–Pruntytown lines together accounted for $246 million or 50 percent of all line congestion costs and were the largest contributors to positive congestion among lines in 2006. The largest contribution to negative congestion among lines came from the Cedar Grove–Clifton line with -$6.36 million in 2006.

Total congestion costs associated with transformers decreased 38 percent from $538 million in 2005 to $335 million in 2006. Congestion on transformers accounted for 21 percent of the total PJM congestion costs in 2006. The Meadow Brook and Kammer transformers together accounted for $103 million or 31 percent of all transformer congestion costs and were the largest contributors to positive congestion costs among transformers in 2006. The largest contribution to negative congestion among transformers came from the Avon transformer in the AEP Control Zone with -$3.57 million in 2006.

Table 7-7 Congestion summary (By facility type): Calendar years 2005 to 2006

	2005				2006			
	Event Hours		Congestion Costs (Millions)		Event Hours		Congestion Costs (Millions)	
Type	Day Ahead	Real Time	Day Ahead	Balancing	Day Ahead	Real Time	Day Ahead	Balancing
Flowgate	824	359	$8.8	$6.4	1,350	859	$5.2	($11.2)
Interface	11,738	3,910	$1,073.3	($50.6)	8,273	2,792	$752.4	$11.6
Line	30,819	12,253	$636.3	($132.3)	34,558	11,447	$585.5	($89.6)
Transformer	12,324	7,587	$626.8	($88.4)	12,118	4,412	$349.2	($14.6)
Unclassified	NA	NA	$11.6	$0.0	NA	NA	$14.9	$0.0
Total	55,705	24,109	$2,356.8	($264.9)	56,299	19,510	$1,707.1	($103.8)

Table 7-8 shows congestion costs by facility voltage class. Congestion costs decreased across 500 kV, 230 kV, 138 kV and 115 kV class facilities in 2006. Congestion costs increased across 765 kV, 345 kV, 69 kV and 12 kV class facilities and unclassified facilities in 2006.

Congestion costs associated with 765 kV facilities increased 371 percent from $3.5 million in 2005 to the $16.7 million experienced in 2006. Congestion on 765 kV facilities comprised 1 percent of total 2006 PJM congestion costs. The Axton–Jacksons Ferry line accounted for $12.5 million or 75 percent of all 765 kV congestion costs and was the largest contributor to positive congestion among 765 kV facilities in 2006. There were no significant contributions to negative congestion from 765 kV facilities in 2006.

17 The PL North Interface congestion cost was not large enough to be in the top 25.

Congestion costs associated with 500 kV facilities decreased 24 percent from $1.349 billion in 2005 to $1.023 billion in 2006. Congestion on 500 kV facilities comprised 64 percent of total 2006 PJM congestion costs. The Bedington–Black Oak and 5004/5005 Interfaces together accounted for $598 million or 58 percent of all 500 kV congestion costs and were the largest contributors to positive congestion among 500 kV facilities in 2006. There were no significant contributions to negative congestion from 500 kV facilities in 2006.

Congestion costs associated with 230 kV facilities decreased 50 percent from $334 million in 2005 to $167 million in 2006. Congestion on 230 kV facilities comprised 10 percent of total 2006 PJM congestion costs. The Doubs and Whitpain transformers together accounted for $52 million or 31 percent of all 230 kV congestion costs and were the largest contributors to positive congestion among 230 kV facilities in 2006. The largest contribution to negative congestion among 230 kV facilities came from the Cedar Grove–Clifton line with -$6.36 million in 2006.

Congestion costs associated with 138 kV facilities decreased 15 percent from $214 million in 2005 to $182 million in 2006. Congestion on 138 kV facilities comprised 11 percent of total 2006 PJM congestion costs. The Meadow Brook and Bedington transformers together accounted for $98 million or 54 percent of all 138 kV congestion costs and were the largest contributors to positive congestion among 138 kV facilities in 2006. The largest contribution to negative congestion among 138 kV facilities came from the State Line–Wolf Lake line with -$4.4 million in 2006.

Table 7-8 Congestion summary (By facility voltage): Calendar years 2005 to 2006

	2005				2006			
	Event Hours		Congestion Costs (Millions)		Event Hours		Congestion Costs (Millions)	
Voltage (kV)	Day Ahead	Real Time	Day Ahead	Balancing	Day Ahead	Real Time	Day Ahead	Balancing
765	64	19	$3.4	$0.1	574	41	$16.9	($0.2)
500	15,881	7,668	$1,460.5	($111.6)	13,170	5,028	$1,007.5	$15.2
345	6,002	3,061	$177.2	($58.2)	5,949	2,481	$177.9	($44.7)
230	12,095	3,865	$390.1	($56.2)	10,249	3,367	$193.3	($26.6)
138	10,230	5,084	$236.6	($22.5)	15,713	5,102	$211.8	($30.1)
115	5,303	1,854	$50.3	($8.1)	4,486	1,344	$48.0	($11.9)
69	6,130	2,558	$27.1	($8.4)	6,129	2,147	$36.8	($5.4)
12	0	0	$0.0	$0.0	29	0	$0.0	$0.0
Unclassified	NA	NA	$11.6	$0.0	NA	NA	$14.9	$0.0
Total	55,705	24,109	$2,356.8	($264.9)	56,299	19,510	$1,707.1	($103.8)

Constraint Duration

Table 7-9 lists calendar year 2005 and 2006 constraints that affected more than 10 percent of PJM load or that were most frequently in effect and shows changes in congestion-event hours from 2005 to 2006.[18]

Constraints 1, 3, 5, 12, 20, 24 and 25 are the primary operating interfaces. For this group, the number of day-ahead-market, congestion-event hours decreased from 13,945 to 10,847 hours between 2005 and 2006. The number of real-time-market, congestion-event hours for the primary interfaces decreased from 6,166 to 4,175 hours between 2005 and 2006. The AP Control Zone facilities, items number 1, 3, 5 and 20, were constrained 10,724 hours in the Day-Ahead Market in 2005, compared to 8,843 hours in 2006. In the Real-Time Market, these AP Control Zone facilities were constrained for 5,581 hours in 2005 and 3,821 hours in 2006. The PJM Mid-Atlantic Region facilities, items number 12, 24 and 25, were constrained 3,221 hours in the Day-Ahead Market in 2005 compared to 2,004 hours in 2006. In the Real-Time Market, these PJM Mid-Atlantic facilities were constrained 585 hours in 2005 and 354 hours in 2006.

Table 7-9 Congestion-event summary: Calendar years 2005 to 2006

			Event Hours						Percent of Annual Hours					
			Day Ahead			Real Time			Day Ahead			Real Time		
No.	Constraint	Type	2005	2006	Change	2005	2006	Change	2005	2006	Change	2005	2006	Change
1	Bedington - Black Oak	Interface	4,569	3,875	(694)	1,924	1,812	(112)	52%	44%	(8%)	22%	21%	(1%)
2	Cedar Grove - Roseland	Line	1,371	3,692	2,321	544	541	(3)	16%	42%	27%	6%	6%	(0%)
3	Wylie Ridge	Transformer	2,300	2,286	(14)	1,869	1,084	(785)	26%	26%	(0%)	21%	12%	(9%)
4	Laurel - Woodstown	Line	1,729	2,157	428	1,009	1,203	194	20%	25%	5%	11%	14%	2%
5	Kammer	Transformer	3,414	2,043	(1,371)	1,749	688	(1,061)	39%	23%	(16%)	20%	8%	(12%)
6	Kanawha - Matt Funk	Line	395	2,025	1,630	532	617	85	4%	23%	19%	6%	7%	1%
7	Cloverdale - Lexington	Line	1,107	1,517	410	679	961	282	13%	17%	5%	8%	11%	3%
8	5004/5005 Interface	Interface	1,906	1,738	(168)	782	341	(441)	22%	20%	(2%)	9%	4%	(5%)
9	Edison - Meadow Rd	Line	636	875	239	256	634	378	7%	10%	3%	3%	7%	4%
10	State Line - Wolf Lake	Flowgate	0	943	943	1	423	422	0%	11%	11%	0%	5%	5%
11	Mount Storm - Pruntytown	Line	379	891	512	986	465	(521)	4%	10%	6%	11%	5%	(6%)
12	West	Interface	589	981	392	370	328	(42)	7%	11%	4%	4%	4%	(0%)
13	Branchburg - Readington	Line	457	704	247	239	480	241	5%	8%	3%	3%	5%	3%
14	Bedington	Transformer	375	662	287	206	451	245	4%	8%	3%	2%	5%	3%
15	Bergen - Leonia	Line	1,026	948	(78)	51	52	1	12%	11%	(1%)	1%	1%	0%
16	Mitchell - Shepler Hill	Line	377	677	300	311	307	(4)	4%	8%	3%	4%	4%	(0%)
17	Elrama	Transformer	285	927	642	61	34	(27)	3%	11%	7%	1%	0%	(0%)
18	Calumet - River E.C.	Line	0	913	913	0	0	0	0%	10%	10%	0%	0%	0%
19	Elrama - Mitchell	Line	230	654	424	244	258	14	3%	7%	5%	3%	3%	0%
20	AP South	Interface	441	639	198	39	237	198	5%	7%	2%	0%	3%	2%
21	Carlls Corner - Sherman Ave	Line	133	712	579	9	160	151	2%	8%	7%	0%	2%	2%
22	Meadow Brook	Transformer	633	726	93	220	124	(96)	7%	8%	1%	3%	1%	(1%)
23	Bergen - Hoboken	Line	568	681	113	121	108	(13)	6%	8%	1%	1%	1%	(0%)
24	Central	Interface	1,261	699	(562)	67	15	(52)	14%	8%	(6%)	1%	0%	(1%)
25	East	Interface	1,371	324	(1,047)	148	11	(137)	16%	4%	(12%)	2%	0%	(2%)

18 Presented in order of descending sum of 2006 day-ahead and real-time congestion-event hours.

Constraint Costs

Table 7-10 presents the top constraints affecting positive congestion costs by facility for calendar years 2005 and 2006.[19] The Bedington–Black Oak Interface was the largest contributor to congestion costs in both 2005 and 2006 and with $492 million in total congestion costs, accounted for 31 percent of the total PJM congestion costs in 2006. The top four constraints in terms of congestion costs together comprised 49 percent of the total PJM congestion costs in 2006.

Table 7-10 Total annual PJM congestion costs (By facility): Calendar years 2005 to 2006

				Congestion Costs (Millions)						Percent of Total PJM Congestion Costs	
				2005			2006				
No.	Constraint	Type	Location	Day Ahead	Balancing	Total	Day Ahead	Balancing	Total	2005	2006
1	Bedington - Black Oak	Interface	500	$607.3	($25.3)	$581.9	$486.1	$5.5	$491.6	28%	31%
2	5004/5005 Interface	Interface	500	$216.4	($17.7)	$198.7	$105.4	$0.6	$106.0	9%	7%
3	Mount Storm - Pruntytown	Line	AP	$50.4	($24.6)	$25.8	$100.3	($1.9)	$98.4	1%	6%
4	Kanawha - Matt Funk	Line	AEP	$41.1	($22.4)	$18.7	$101.9	($17.5)	$84.4	1%	5%
5	AP South	Interface	500	$57.1	($0.6)	$56.5	$76.2	$4.6	$80.8	3%	5%
6	Cloverdale - Lexington	Line	AEP	$36.2	($11.3)	$24.9	$64.8	($1.9)	$63.0	1%	4%
7	West	Interface	500	$45.7	($1.2)	$44.4	$55.5	$0.9	$56.4	2%	4%
8	Meadow Brook	Transformer	AP	$52.4	($2.0)	$50.4	$54.9	$0.4	$55.2	2%	3%
9	Kammer	Transformer	500	$147.7	($8.6)	$139.1	$41.7	$5.7	$47.4	7%	3%
10	Bedington	Transformer	AP	$16.7	($1.1)	$15.6	$45.7	($2.7)	$42.9	1%	3%
11	Doubs - Mount Storm	Line	500	$138.7	($13.1)	$125.6	$38.0	$0.5	$38.5	6%	2%
12	Doubs	Transformer	AP	$146.0	($0.3)	$145.7	$32.5	$0.3	$32.8	7%	2%
13	Axton	Transformer	AEP	$0.5	$0.0	$0.5	$23.8	($0.7)	$23.1	0%	1%
14	Whitpain	Transformer	PECO	$29.2	($1.7)	$27.4	$21.5	($2.4)	$19.1	1%	1%
15	Aqueduct - Doubs	Line	AP	$0.1	$0.0	$0.1	$18.4	$0.1	$18.5	0%	1%
16	Laurel - Woodstown	Line	AECO	$10.1	($1.1)	$9.0	$20.8	($3.7)	$17.2	0%	1%
17	Cedar Grove - Roseland	Line	PSEG	$15.7	($16.9)	($1.2)	$21.6	($5.4)	$16.2	0%	1%
18	Central	Interface	500	$44.8	($0.9)	$43.8	$15.8	($0.1)	$15.7	2%	1%
19	Unclassified	Unclassified	NA	$11.6	$0.0	$11.6	$14.9	$0.0	$14.9	1%	1%
20	East	Interface	500	$96.3	($1.8)	$94.5	$12.9	$0.2	$13.1	5%	1%
21	Wylie Ridge	Transformer	AP	$53.3	($37.7)	$15.6	$27.4	($14.3)	$13.1	1%	1%
22	Axton - Jacksons Ferry	Line	AEP	$2.1	($0.1)	$2.1	$12.7	($0.2)	$12.5	0%	1%
23	Dooms	Transformer	Dominion	$1.2	$0.2	$1.4	$12.4	($0.6)	$11.8	0%	1%
24	Cloverdale	Transformer	AEP	$7.3	$0.0	$7.3	$11.8	($0.3)	$11.5	0%	1%
25	Hunterstown	Transformer	Met-Ed	$4.8	$0.1	$4.9	$9.8	($0.2)	$9.5	0%	1%

19 Presented in descending order of 2006 total congestion costs.

Congestion-Event Summary for Midwest ISO Flowgates

Before the Phase 2 integration of ComEd began, PJM and the Midwest ISO had developed a JOA which defined a coordinated methodology for congestion management.[20] This agreement establishes reciprocal, coordinated flowgates in the combined footprint whose operating limits are respected by both operators. A flowgate consists of one or more transmission elements intended to model MW flow and its impact on transmission limitations and transmission service usage.[21] PJM models these coordinated flowgates and controls for them in its security-constrained, economic dispatch. Table 7-11 shows the Midwest ISO flowgates which PJM took dispatch action to control during 2006 and which had the greatest congestion cost impact on PJM. Total congestion costs are the sum of the day-ahead and balancing congestion cost components. Total congestion costs associated with a given constraint may be positive or negative in value. The top congestion cost impacts for Midwest ISO flowgates impacting PJM dispatch are presented by constraint, in descending order of the absolute value of total 2006 congestion costs. Among Midwest ISO flowgates in 2005, the Eau Claire–Arpin line constraint made the most significant contribution to negative congestion while the Crete–St. Johns Tap line made the most significant contribution to positive congestion. Among Midwest ISO flowgates in 2006, the State Line–Wolf Lake flowgate made the most significant contribution to negative congestion, while the Pierce and Rising flowgates made the most significant positive contributions.

Table 7-11 Top congestion cost impacts for Midwest ISO flowgates impacting PJM dispatch (By facility): Calendar years 2005 to 2006

			Congestion Costs (Millions)				Event Hours			
			2005		2006		2005		2006	
Constraint	Type	Location	Day Ahead	Balancing	Day Ahead	Balancing	Day Ahead	Real Time	Day Ahead	Real Time
State Line - Wolf Lake	Flowgate	Midwest ISO	$0.0	$0.0	$3.2	($7.6)	0	1	943	423
Lanesville	Flowgate	Midwest ISO	$0.0	$0.0	$0.6	($2.4)	0	0	43	99
Pierce	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	$0.5	0	0	0	21
New London - Webster	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	($0.4)	0	0	0	27
Rising	Flowgate	Midwest ISO	$0.0	$0.0	$0.3	$0.0	0	0	111	59
Dunes Acres - Michigan City	Flowgate	Midwest ISO	$0.3	($0.3)	$0.3	($0.6)	23	67	51	81
Breed - West Casey	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	($0.1)	0	0	0	9
Crete - St Johns Tap	Flowgate	Midwest ISO	$8.6	$6.3	$0.1	$0.0	790	108	7	5
Bain - Kenosha	Flowgate	Midwest ISO	$0.0	$0.0	$0.1	($0.0)	0	0	92	26
Pana North	Flowgate	Midwest ISO	$0.0	$0.0	$0.6	($0.5)	0	0	103	79
State Line - Roxana	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	($0.0)	11	2	0	6
Powerton - Tazewell	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	$0.0	0	0	0	2
Pleasant Prairie - Zion	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	($0.0)	0	0	0	1
Gillespie Tap - Laclede Tap	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	($0.0)	0	0	0	5
Eau Claire - Arpin	Flowgate	Midwest ISO	$0.0	($0.4)	$0.0	$0.0	0	66	0	6

20 See "Joint Operating Agreement between the Midwest Independent System Operator, Inc. and PJM Interconnection, L.L.C." (December 31, 2003) <http://www.pjm.com/documents/ downloads/agreements/joa-complete.pdf> (1,331 KB). The agreement is referred to here as the JOA.

21 See NERC Operating Manual, "Flowgate Administration Reference Document," Version 1 (March 21, 2002).

Congestion-Event Summary for the 500 kV System

Constraints on the 500 kV system generally have a regional impact. Table 7-12 shows the 500 kV constraints with the largest impact on total congestion costs in PJM. Total congestion costs are the sum of the day-ahead and balancing congestion cost components. Total congestion costs associated with a given constraint may be positive or negative in value. The 500 kV constraints with the largest impact on total congestion costs in PJM are presented by constraint, in descending order of the absolute value of total 2006 congestion costs. In 2005, the Harrison–Harrison Tap and Belmont–Harrison line constraints contributed to negative congestion while the Kammer transformer, Bedington–Black Oak and 5004/5005 Interfaces contributed to positive congestion. In 2006, no 500 kV zone facilities contributed significantly to negative congestion. The Bedington–Black Oak Interface constraint was the largest 500 kV zone contributor to positive congestion in 2006. The AP South and 5004/5005 Interface constraints were also significant contributors to positive congestion in 2006.

Table 7-12 Regional constraints summary (By facility): Calendar years 2005 to 2006

			Congestion Costs (Millions)				Event Hours			
			2005		2006		2005		2006	
Constraint	Type	Location	Day Ahead	Balancing	Day Ahead	Balancing	Day Ahead	Real Time	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$607.3	($25.3)	$486.1	$5.5	4,569	1,924	3,875	1,812
5004/5005 Interface	Interface	500	$216.4	($17.7)	$105.4	$0.6	1,906	782	1,738	341
AP South	Interface	500	$57.1	($0.6)	$76.2	$4.6	441	39	639	237
West	Interface	500	$45.7	($1.2)	$55.5	$0.9	589	370	981	328
Kammer	Transformer	500	$147.7	($8.6)	$41.7	$5.7	3,414	1,749	2,043	688
Doubs - Mount Storm	Line	500	$138.7	($13.1)	$38.0	$0.5	548	545	240	50
Central	Interface	500	$44.8	($0.9)	$15.8	($0.1)	1,261	67	699	15
East	Interface	500	$96.3	($1.8)	$12.9	$0.2	1,371	148	324	11
Fort Martin - Pruntytown	Line	500	$14.7	($0.2)	$5.9	($0.0)	136	21	111	22
Harrison Tap - Kammer	Line	500	$0.1	($0.1)	$0.6	$0.2	1	14	51	52
Elroy - Hosensack	Line	500	$0.0	$0.3	$0.0	$0.0	0	40	0	4
Harrison - Harrison Tap	Line	500	$0.0	($0.1)	$0.0	$0.0	0	26	0	3
Alburtis - Branchburg	Line	500	$0.0	($0.0)	$0.0	$0.0	0	3	0	0
Belmont - Harrison	Line	500	$0.0	($0.3)	$0.0	$0.0	0	4	0	0
Branchburg - Elroy	Line	500	$0.3	($0.3)	$0.0	$0.0	10	8	0	0

Congestion on the Bedington-Black Oak and AP South Interfaces

The AP extra-high-voltage (EHV) system is the primary conduit for energy transfers from the AP and midwestern generating resources to southwestern PJM and eastern Virginia load and, to a lesser extent, to the central and eastern portion of the PJM Mid-Atlantic Region. Two AP interface constraints, Bedington–Black Oak and AP South, often restrict west-to-east energy transfers across the AP EHV system. Bedington–Black Oak was the largest contributor to congestion costs of any facility in PJM in calendar year 2006. In 2006, congestion costs associated with the Bedington–Black Oak and AP South Interface constraints were $492 million and $81 million, respectively. In 2006, Bedington–Black Oak and AP South were constrained 3,875 hours and 639 hours day ahead, respectively. Bedington–Black Oak and AP South were constrained 1,812 hours and 237 hours in real time in 2006, respectively. In 2005, congestion costs associated with Bedington-Black Oak and AP South were $582 million and $57 million, respectively. In 2005, Bedington–Black Oak and AP South were constrained 4,569 hours and 441 hours day ahead, respectively. Bedington–Black Oak and AP South were constrained 1,924 hours and 39 hours in real time in 2005, respectively. These results are summarized in Table 7-12.

Zonal Congestion

Summary

Day-ahead and balancing congestion costs within specific zones for calendar years 2005 to 2006 are presented in Table 7-13. The AP Control Zone, with $459.9 million, incurred the most congestion charges of any control zone in 2005. The leading contributors to congestion in the AP Control Zone in 2005 were the Bedington–Black Oak Interface and the Doubs transformer. These two facilities contributed $214.6 and $73.3 million in positive congestion costs, respectively, and together constituted 63 percent of all congestion charges in the AP Control Zone. The AEP Control Zone incurred the second highest amount of congestion charges in 2005, driven by congestion on the Kammer transformer and the Bedington–Black Oak Interface. These two facilities constituted $44.5 and $72 million in congestion charges, respectively, or 57 percent of the AEP Control Zone total.

In 2006, the AP and AEP Control Zones were once again the top two in terms of congestion charges. In the AP Control Zone, the Bedington–Black Oak Interface was again a leading contributor along with the Meadow Brook transformer. Together, these two facilities contributed a total of $208 million in congestion, or 61 percent of the AP Control Zone total. Congestion in the AEP Control Zone was driven by the Kanawha–Matt Funk line and the Bedington–Black Oak Interface. These two facilities contributed $104 million in congestion charges or 43 percent of the AEP Control Zone total.

Table 7-13 Congestion cost summary (By zone): Calendar years 2005 to 2006

	Congestion Costs (Millions)					
	2005			2006		
Control Zone	Day Ahead	Balancing	Total	Day Ahead	Balancing	Total
AECO	$70.4	$13.5	$83.8	$62.0	$5.3	$67.2
AEP	$351.2	($147.0)	$204.2	$302.1	($60.4)	$241.7
AP	$508.7	($48.9)	$459.9	$379.4	($39.3)	$340.1
BGE	$44.4	$52.8	$97.1	$64.3	$40.7	$105.0
ComEd	$60.5	$140.5	$201.0	$87.6	$61.3	$149.0
DAY	$31.5	($16.6)	$14.9	$21.8	($8.1)	$13.6
DLCO	$94.3	($50.9)	$43.4	$50.2	($21.8)	$28.4
Dominion	$236.1	($55.6)	$180.5	$259.4	($34.7)	$224.7
DPL	$109.3	$8.8	$118.1	$72.7	$14.5	$87.3
JCPL	$153.3	$9.2	$162.4	$94.8	$1.1	$95.9
Met-Ed	$38.4	($10.7)	$27.7	$27.3	($13.2)	$14.2
PECO	$33.5	($55.5)	($22.0)	($26.7)	($27.6)	($54.3)
PENELEC	$158.4	($3.7)	$154.7	$113.7	($10.3)	$103.4
PEPCO	$191.1	$1.6	$192.7	$155.3	$25.7	$181.0
PJM	$96.3	($61.3)	$34.9	($36.0)	($17.6)	($53.7)
PPL	($52.0)	($15.8)	($67.8)	($31.7)	($6.0)	($37.7)
PSEG	$212.7	($23.3)	$189.4	$99.4	($13.9)	$85.6
RECO	$18.8	($1.9)	$16.9	$11.5	$0.5	$12.0

Details of Regional and Zonal Congestion

Constraints were examined by zone and categorized by their effect on regions. Zones correspond to regulated utility franchise areas. Regions generally comprise two or more zones. PJM is comprised of three regions composed of the PJM Mid-Atlantic Region with 11 control zones,[22] the PJM Western Region with five control zones (the AP, ComEd, AEP, DLCO and DAY Control Zones) and the PJM Southern Region with one control zone (the Dominion Control Zone).

Table 7-14 through Table 7-30 present the top constraints affecting zonal congestion costs by control zone and demonstrate the influence of individual constraints on zonal congestion costs in calendar years 2005 and 2006. For each of these constraints, the zonal cost impacts are decomposed into their day-ahead and balancing market components. Total congestion costs are the sum of the day-ahead and balancing congestion cost components. Total congestion costs associated with a given constraint may be positive or negative in value. The top constraints affecting zonal congestion costs are presented by constraint, in descending order of the absolute value of total 2006 congestion costs. Both day-ahead and real-time,

22 The Mid-Atlantic Region is comprised of the AECO, BGE, DPL, JCPL, Met-Ed, PECO, PENELEC, PEPCO, PPL, PSEG and RECO Control Zones.

congestion-event hours are presented for each of the highlighted constraints. Constraints can have wide-ranging effects, influencing prices across multiple zones.

Mid-Atlantic Region Congestion-Event Summaries

AECO Control Zone

Table 7-14 shows the constraints with the largest impacts on total congestion cost in the AECO Control Zone. In 2005, the Cedar Grove–Roseland and Branchburg–Readington line constraints contributed to negative congestion while the Kammer transformer, Bedington–Black Oak and 5004/5005 Interfaces contributed to positive congestion. All of these constraints are located outside of the AECO Control Zone. In 2006, the Cedar Grove–Roseland and Branchburg–Readington line constraints again contributed significantly to negative congestion. The Laurel–Woodstown constraint increased significantly in both congestion costs and congestion-event hours and was the largest contributor to positive congestion in 2006 in the AECO Control Zone. As in 2005, in 2006 the Bedington–Black Oak and 5004/5005 Interface constraints resulted in large contributions to positive congestion costs.

Table 7-14 AECO Control Zone top congestion cost impacts (By facility): Calendar years 2005 to 2006

			Congestion Costs (Millions)				Event Hours			
			2005		2006		2005		2006	
Constraint	Type	Location	Day Ahead	Balancing	Day Ahead	Balancing	Day Ahead	Real Time	Day Ahead	Real Time
Laurel - Woodstown	Line	AECO	$10.2	($1.1)	$20.9	($3.3)	1,729	1,009	2,157	1,203
Bedington - Black Oak	Interface	500	$12.0	$4.5	$11.3	$3.4	4,569	1,924	3,875	1,812
5004/5005 Interface	Interface	500	$8.6	$3.0	$6.1	$1.1	1,906	782	1,738	341
Cedar Grove - Roseland	Line	PSEG	($1.2)	($2.1)	($4.1)	($0.9)	1,371	544	3,692	541
Mount Storm - Pruntytown	Line	AP	$1.0	$1.6	$2.8	$0.5	379	986	891	465
West	Interface	500	$1.5	$1.4	$2.3	$0.9	589	370	981	328
Kammer	Transformer	500	$6.1	$3.6	$2.3	$0.7	3,414	1,749	2,043	688
Wylie Ridge	Transformer	AP	$2.9	$2.9	$1.9	$1.0	2,300	1,869	2,286	1,084
Branchburg - Readington	Line	PSEG	($0.4)	($0.9)	($1.4)	($1.4)	457	239	704	480
Cloverdale - Lexington	Line	AEP	$0.9	$0.6	$1.4	$1.1	1,107	679	1,517	961
Central	Interface	500	$3.4	$0.2	$2.3	$0.0	1,261	67	699	15
AP South	Interface	500	$0.9	$0.1	$1.5	$0.7	441	39	639	237
Kanawha - Matt Funk	Line	AEP	$0.3	$0.6	$1.3	$0.5	395	532	2,025	617
Deepwater	Transformer	AECO	$0.0	$0.0	$1.7	$0.1	0	0	66	67
Carlls Corner - Sherman Ave	Line	AECO	$0.3	$0.0	$1.8	($0.1)	133	9	712	160

BGE Control Zone

Table 7-15 shows the constraints with the largest impacts on total congestion cost in the BGE Control Zone. In 2005, the Cedar Grove–Roseland and Branchburg–Readington constraints contributed to negative congestion while the Bedington–Black Oak Interface and Doubs transformer constraints contributed significantly to positive congestion. In 2006, the Cedar Grove–Roseland and Branchburg–Readington constraints were again the largest contributors to negative congestion. The Bedington–Black Oak and AP South Interfaces along with the Mount Storm–Pruntytown lines were the largest contributors to positive congestion with the AP South Interface experiencing an increase in congestion-event hours as compared to 2005.

Table 7-15 BGE Control Zone top congestion cost impacts (By facility): Calendar years 2005 to 2006

			Congestion Costs (Millions)				Event Hours			
			2005		2006		2005		2006	
Constraint	Type	Location	Day Ahead	Balancing	Day Ahead	Balancing	Day Ahead	Real Time	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$15.2	$21.9	$24.3	$21.5	4,569	1,924	3,875	1,812
Mount Storm - Pruntytown	Line	AP	($0.2)	$7.6	$4.4	$2.4	379	986	891	465
AP South	Interface	500	($0.4)	$0.3	$3.3	$3.1	441	39	639	237
Aqueduct - Doubs	Line	AP	$0.0	$0.0	$5.9	$0.5	14	0	362	127
5004/5005 Interface	Interface	500	$7.7	$2.0	$5.2	$0.2	1,906	782	1,738	341
Doubs - Mount Storm	Line	500	$5.8	$8.6	$3.8	$1.3	548	545	240	50
West	Interface	500	$1.6	$1.8	$3.5	$1.1	589	370	981	328
Kammer	Transformer	500	$0.7	$7.5	$1.4	$3.0	3,414	1,749	2,043	688
Wylie Ridge	Transformer	AP	$2.3	$4.5	$1.3	$2.3	2,300	1,869	2,286	1,084
Cloverdale - Lexington	Line	AEP	($0.6)	$1.7	($0.7)	$4.2	1,107	679	1,517	961
Doubs	Transformer	AP	$12.3	$2.2	$3.1	$0.2	1,007	686	90	74
Cedar Grove - Roseland	Line	PSEG	$0.3	($2.9)	($2.3)	($0.8)	1,371	544	3,692	541
Conastone	Transformer	BGE	$0.0	$0.1	$2.5	$0.3	3	24	99	27
Branchburg - Readington	Line	PSEG	($0.3)	($1.9)	($0.4)	($2.1)	457	239	704	480
Kanawha - Matt Funk	Line	AEP	($0.2)	$2.7	($0.6)	$3.1	395	532	2,025	617

DPL Control Zone

Table 7-16 shows the constraints with the largest impacts on total congestion cost in the DPL Control Zone. In 2005, the Cedar Grove–Roseland and Branchburg–Readington line constraints contributed significantly to negative congestion while the Kammer transformer and the Bedington–Black Oak and 5004/5005 Interfaces contributed significantly to positive congestion. In 2006, the Cedar Grove–Roseland and Branchburg–Readington line constraints were again the top contributors to negative congestion. The Bedington–Black Oak and 5004/5005 Interfaces were the largest contributors to positive congestion in 2006.

Table 7-16 DPL Control Zone top congestion cost impacts (By facility): Calendar years 2005 to 2006

			Congestion Costs (Millions)				Event Hours			
			2005		2006		2005		2006	
Constraint	Type	Location	Day Ahead	Balancing	Day Ahead	Balancing	Day Ahead	Real Time	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$26.9	$1.6	$22.4	$6.5	4,569	1,924	3,875	1,812
5004/5005 Interface	Interface	500	$16.0	($0.3)	$10.0	$0.8	1,906	782	1,738	341
Cedar Grove - Roseland	Line	PSEG	($3.5)	($1.2)	($8.3)	($1.7)	1,371	544	3,692	541
Kammer	Transformer	500	$17.1	$3.7	$5.1	$1.9	3,414	1,749	2,043	688
Wylie Ridge	Transformer	AP	$8.9	$1.9	$3.8	$2.3	2,300	1,869	2,286	1,084
West	Interface	500	$4.2	$1.6	$4.4	$1.7	589	370	981	328
Mount Storm - Pruntytown	Line	AP	$2.1	$0.7	$5.4	$0.6	379	986	891	465
Cloverdale - Lexington	Line	AEP	$2.6	$0.6	$3.8	$1.9	1,107	679	1,517	961
Branchburg - Readington	Line	PSEG	($1.0)	($1.7)	($2.7)	($2.5)	457	239	704	480
Central	Interface	500	$8.3	($0.0)	$4.5	$0.0	1,261	67	699	15
Kanawha - Matt Funk	Line	AEP	$1.3	$0.3	$2.8	$1.1	395	532	2,025	617
AP South	Interface	500	$2.0	$0.0	$2.7	$1.1	441	39	639	237
Doubs - Mount Storm	Line	500	$5.7	($0.6)	$1.8	$0.5	548	545	240	50
Mardela - Vienna	Line	DPL	$0.0	($0.0)	$2.4	($0.3)	0	2	236	103
East	Interface	500	$11.2	($0.1)	$1.5	$0.1	1,371	148	324	11

JCPL Control Zone

Table 7-17 shows the constraints with the largest impacts on total congestion cost in the JCPL Control Zone. In 2006, as was the case in 2005, the Cedar Grove–Roseland and Branchburg–Readington lines, both PSEG Control Zone facilities, contributed significantly to negative congestion. In 2005, the Bedington–Black Oak and 5004/5005 Interfaces were the top contributors to positive congestion. In 2006, the Bedington–Black Oak Interface was the largest contributor to positive congestion costs followed by the 5004/5005 Interface.

Table 7-17 JCPL Control Zone top congestion cost impacts (By facility): Calendar years 2005 to 2006

			Congestion Costs (Millions)				Event Hours			
			2005		2006		2005		2006	
Constraint	Type	Location	Day Ahead	Balancing	Day Ahead	Balancing	Day Ahead	Real Time	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$34.1	$3.1	$31.0	$1.5	4,569	1,924	3,875	1,812
Cedar Grove - Roseland	Line	PSEG	($10.8)	($4.4)	($29.9)	($0.9)	1,371	544	3,692	541
5004/5005 Interface	Interface	500	$29.2	$4.1	$19.2	$1.1	1,906	782	1,738	341
West	Interface	500	$7.3	$1.5	$10.4	$0.6	589	370	981	328
Kammer	Transformer	500	$24.0	$3.1	$9.3	$0.5	3,414	1,749	2,043	688
Wylie Ridge	Transformer	AP	$13.2	$2.9	$7.2	$0.8	2,300	1,869	2,286	1,084
Mount Storm - Pruntytown	Line	AP	$2.9	$0.9	$6.7	($0.0)	379	986	891	465
Central	Interface	500	$11.5	$0.2	$6.2	$0.0	1,261	67	699	15
Cloverdale - Lexington	Line	AEP	$2.9	$0.9	$5.3	$0.7	1,107	679	1,517	961
Kanawha - Matt Funk	Line	AEP	$2.1	$0.2	$5.4	$0.4	395	532	2,025	617
AP South	Interface	500	$2.7	$0.0	$4.1	$0.6	441	39	639	237
Unclassified	Unclassified	NA	$1.8	$0.0	$4.2	$0.0	NA	NA	NA	NA
Branchburg - Readington	Line	PSEG	$0.9	($2.1)	$0.2	($4.3)	457	239	704	480
Doubs - Mount Storm	Line	500	$7.8	$2.9	$2.6	($0.2)	548	545	240	50
East	Interface	500	$13.6	$0.3	$2.0	$0.0	1,371	148	324	11

Met-Ed Control Zone

Table 7-18 shows the constraints with the largest impacts on total congestion cost in the Met-Ed Control Zone. In 2005, the Doubs–Mount Storm and Mount Storm–Pruntytown constraints contributed to negative congestion while the Kammer transformer and 5004/5005 Interface constraints contributed significantly to positive congestion. In 2006, the AP South Interface, Cedar Grove–Roseland and Aqueduct–Doubs lines were the largest contributors to negative congestion. The Hunterstown and Jackson transformers, both Met-Ed Control Zone facilities, and the PJM West Interface were the largest contributors to positive congestion.

Table 7-18 Met-Ed Control Zone top congestion cost impacts (By facility): Calendar years 2005 to 2006

			Congestion Costs (Millions)				Event Hours			
			2005		2006		2005		2006	
Constraint	Type	Location	Day Ahead	Balancing	Day Ahead	Balancing	Day Ahead	Real Time	Day Ahead	Real Time
Hunterstown	Transformer	Met-Ed	$3.1	$0.0	$6.8	($0.2)	125	53	303	66
Jackson	Transformer	Met-Ed	$0.7	$0.0	$4.1	($0.0)	29	56	117	54
West	Interface	500	$2.0	($0.7)	$2.3	($0.2)	589	370	981	328
5004/5005 Interface	Interface	500	$8.7	($2.6)	$2.8	($1.1)	1,906	782	1,738	341
Gardners - Hunterstown	Line	Met-Ed	$0.0	($0.1)	$1.7	($0.7)	6	54	496	257
AP South	Interface	500	$0.9	($0.1)	$0.4	($1.4)	441	39	639	237
Kammer	Transformer	500	$6.5	($1.5)	$1.8	($0.8)	3,414	1,749	2,043	688
Cedar Grove - Roseland	Line	PSEG	($1.1)	$1.9	($1.6)	$0.8	1,371	544	3,692	541
Aqueduct - Doubs	Line	AP	($0.0)	$0.0	($0.6)	($0.2)	14	0	362	127
Middletown Jct	Transformer	Met-Ed	$0.0	$0.0	$0.9	($0.0)	0	15	25	16
Cloverdale - Lexington	Line	AEP	$0.4	($0.2)	$0.6	($1.4)	1,107	679	1,517	961
Mount Storm - Pruntytown	Line	AP	$0.5	($2.2)	$0.3	($1.1)	379	986	891	465
Middletown Jct - S Lebanon	Line	Met-Ed	$0.0	$0.0	$0.7	$0.0	0	0	15	0
Doubs - Mount Storm	Line	500	$1.4	($4.1)	($0.2)	($0.5)	548	545	240	50
Brunner Island - Yorkana	Line	Met-Ed	$0.0	$0.0	$0.4	$0.2	0	6	19	34

PECO Control Zone

Table 7-19 shows the constraints with the largest impacts on total congestion cost in the PECO Control Zone. In 2005, the Bedington–Black Oak and 5004/5005 Interface constraints along with the Kammer transformer contributed significantly to negative congestion while the Whitpain transformer and PJM East Interface constraints contributed to positive congestion. In 2006, the Bedington–Black Oak and 5004/5005 Interface constraints contributed significantly to negative congestion. The Whitpain transformer and Cedar Grove–Roseland line constraints were the most significant contributors to positive congestion in 2006.

Table 7-19 PECO Control Zone top congestion cost impacts (By facility): Calendar years 2005 to 2006

			Congestion Costs (Millions)				Event Hours			
			2005		2006		2005		2006	
Constraint	Type	Location	Day Ahead	Balancing	Day Ahead	Balancing	Day Ahead	Real Time	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	($12.5)	($13.8)	($22.1)	($11.2)	4,569	1,924	3,875	1,812
Whitpain	Transformer	PECO	$20.9	($2.1)	$16.5	($2.7)	202	81	193	125
5004/5005 Interface	Interface	500	($4.0)	($8.1)	($7.4)	($2.2)	1,906	782	1,738	341
Cedar Grove - Roseland	Line	PSEG	$0.4	$4.5	$3.8	$2.6	1,371	544	3,692	541
AP South	Interface	500	($1.2)	($0.2)	($4.0)	($2.4)	441	39	639	237
West	Interface	500	($3.6)	($2.4)	($4.3)	($1.9)	589	370	981	328
Kammer	Transformer	500	($8.9)	($8.7)	($4.4)	($1.7)	3,414	1,749	2,043	688
Wylie Ridge	Transformer	AP	($1.7)	($6.6)	($3.6)	($2.1)	2,300	1,869	2,286	1,084
Mount Storm - Pruntytown	Line	AP	($0.2)	($5.0)	($3.0)	($1.7)	379	986	891	465
Kanawha - Matt Funk	Line	AEP	($0.4)	($1.0)	($2.7)	($1.5)	395	532	2,025	617
Branchburg - Readington	Line	PSEG	$0.7	$2.2	$1.9	$2.2	457	239	704	480
Central	Interface	500	($4.7)	($0.6)	($3.7)	($0.1)	1,261	67	699	15
East	Interface	500	$28.7	($0.6)	$3.7	$0.0	1,371	148	324	11
Cloverdale - Lexington	Line	AEP	($0.7)	($1.6)	$0.2	($3.0)	1,107	679	1,517	961
Doubs - Mount Storm	Line	500	($4.0)	($8.0)	($1.8)	($0.7)	548	545	240	50

PENELEC Control Zone

Table 7-20 shows the constraints with the largest impacts on total congestion cost in the PENELEC Control Zone. In 2005, the Kammer and Wylie Ridge transformer constraints contributed significantly to negative congestion while the Bedington–Black Oak and 5004/5005 Interfaces contributed to positive congestion. In 2006, the Kammer and Wylie Ridge transformer constraints were again the top contributors to negative congestion. The Cedar Grove–Roseland constraint increased significantly in both congestion costs and congestion-event hours and was the third largest contributor to positive congestion in 2006 in the PENELEC Control Zone. As in 2005, 2006 saw the largest contribution to positive congestion cost from the 5004/5005 Interface followed by the Bedington–Black Oak Interface constraint.

Table 7-20 PENELEC Control Zone top congestion cost impacts (By facility): Calendar years 2005 to 2006

			Congestion Costs (Millions)				Event Hours			
			2005		2006		2005		2006	
Constraint	Type	Location	Day Ahead	Balancing	Day Ahead	Balancing	Day Ahead	Real Time	Day Ahead	Real Time
5004/5005 Interface	Interface	500	$79.3	($3.5)	$45.9	($0.8)	1,906	782	1,738	341
Bedington - Black Oak	Interface	500	$30.2	$1.0	$24.2	($0.3)	4,569	1,924	3,875	1,812
Cedar Grove - Roseland	Line	PSEG	$6.9	$0.7	$20.8	($0.1)	1,371	544	3,692	541
Wylie Ridge	Transformer	AP	($37.8)	$0.7	($17.9)	($1.4)	2,300	1,869	2,286	1,084
West	Interface	500	$13.8	($0.4)	$18.1	($0.4)	589	370	981	328
Kammer	Transformer	500	($45.0)	($1.0)	($15.7)	($0.2)	3,414	1,749	2,043	688
Central	Interface	500	$19.1	($0.1)	$8.9	($0.0)	1,261	67	699	15
Branchburg - Readington	Line	PSEG	$2.2	($0.0)	$6.8	$0.5	457	239	704	480
Seward	Transformer	PENELEC	$4.7	$0.1	$6.0	($0.1)	308	9	258	11
Kanawha - Matt Funk	Line	AEP	($1.3)	($0.3)	($4.4)	($0.8)	395	532	2,025	617
Mount Storm - Pruntytown	Line	AP	$1.8	$0.0	$4.7	($0.1)	379	986	891	465
Goudey - Laurel Lake	Line	PENELEC	$0.0	$0.0	$0.0	($4.4)	0	8	13	53
Cloverdale - Lexington	Line	AEP	($2.6)	$0.1	($3.9)	$0.2	1,107	679	1,517	961
Bedington	Transformer	AP	$0.9	$0.0	$2.6	$0.2	375	206	662	451
Altoona - Johnstown	Line	PENELEC	$3.3	$0.2	$2.5	($0.1)	178	15	107	8

PEPCO Control Zone

Table 7-21 shows the constraints with the largest impacts on total congestion cost in the PEPCO Control Zone. In 2005, the Cedar Grove–Roseland and Branchburg–Readington line constraints contributed significantly to negative congestion while the Bedington–Black Oak Interface and Kammer transformer constraints contributed to positive congestion. In 2006, the Cedar Grove–Roseland line was the largest contributor to negative congestion followed by the Branchburg–Readington line. The Bedington–Black Oak Interface and Mount Storm–Pruntytown constraints were the largest contributors to positive congestion in 2006 in the PEPCO Control Zone.

Table 7-21 PEPCO Control Zone top congestion cost impacts (By facility): Calendar years 2005 to 2006

			Congestion Costs (Millions)				Event Hours			
			2005		2006		2005		2006	
Constraint	Type	Location	Day Ahead	Balancing	Day Ahead	Balancing	Day Ahead	Real Time	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$86.3	$0.2	$72.2	$13.5	4,569	1,924	3,875	1,812
Mount Storm - Pruntytown	Line	AP	$7.4	($0.6)	$15.4	$1.0	379	986	891	465
AP South	Interface	500	$6.7	$0.1	$10.8	$2.7	441	39	639	237
Cloverdale - Lexington	Line	AEP	$8.6	($1.8)	$7.4	$4.0	1,107	679	1,517	961
Cedar Grove - Roseland	Line	PSEG	($4.4)	$1.5	($10.0)	($0.6)	1,371	544	3,692	541
Aqueduct - Doubs	Line	AP	$0.1	$0.0	$10.6	($0.4)	14	0	362	127
Kammer	Transformer	500	$33.3	$0.3	$8.0	$1.8	3,414	1,749	2,043	688
Kanawha - Matt Funk	Line	AEP	$3.3	($0.4)	$7.9	$1.4	395	532	2,025	617
Doubs - Mount Storm	Line	500	$12.1	$1.7	$4.6	$1.4	548	545	240	50
Doubs	Transformer	AP	$20.2	$1.2	$5.9	($0.1)	1,007	686	90	74
Wylie Ridge	Transformer	AP	$12.2	($0.3)	$4.2	$0.8	2,300	1,869	2,286	1,084
West	Interface	500	$4.0	$0.2	$3.4	$0.2	589	370	981	328
Bedington	Transformer	AP	$0.3	$0.2	$3.3	$0.2	375	206	662	451
Dickerson - Doubs	Line	PEPCO	$0.0	$0.0	$3.3	$0.1	0	0	116	11
Branchburg - Readington	Line	PSEG	($0.9)	($0.6)	($2.8)	($0.6)	457	239	704	480

PPL Control Zone

Table 7-22 shows the constraints with the largest impacts on total congestion cost in the PPL Control Zone. In 2005, the Kammer transformer and 5004/5004 Interface constraints contributed significantly to negative congestion while the PJM East Interface and Cedar Grove–Roseland constraints contributed to positive congestion. In 2006, the Bedington–Black Oak and 5004/5005 Interface constraints were the greatest contributors to negative congestion. The Cedar Grove–Roseland constraint increased in both congestion costs and congestion-event hours and was the largest contributor to positive congestion in 2006 in the PPL Control Zone.

Table 7-22 PPL Control Zone top congestion cost impacts (By facility): Calendar years 2005 to 2006

			Congestion Costs (Millions)				Event Hours			
			2005		2006		2005		2006	
Constraint	Type	Location	Day Ahead	Balancing	Day Ahead	Balancing	Day Ahead	Real Time	Day Ahead	Real Time
5004/5005 Interface	Interface	500	($27.5)	($3.7)	($13.2)	($1.0)	1,906	782	1,738	341
Bedington - Black Oak	Interface	500	($11.8)	($3.5)	($7.2)	($1.2)	4,569	1,924	3,875	1,812
Cedar Grove - Roseland	Line	PSEG	$4.3	$0.1	$7.6	($0.0)	1,371	544	3,692	541
West	Interface	500	($3.8)	($0.6)	($4.5)	$0.2	589	370	981	328
Central	Interface	500	($9.4)	($0.3)	($4.2)	($0.0)	1,261	67	699	15
Wylie Ridge	Transformer	AP	($8.5)	($1.8)	($2.8)	($0.6)	2,300	1,869	2,286	1,084
Cloverdale - Lexington	Line	AEP	($1.4)	$0.2	($3.5)	$0.2	1,107	679	1,517	961
Kanawha - Matt Funk	Line	AEP	($1.1)	($0.1)	($2.4)	($0.8)	395	532	2,025	617
Kammer	Transformer	500	($14.1)	($1.7)	($2.6)	($0.2)	3,414	1,749	2,043	688
Mount Storm - Pruntytown	Line	AP	($1.3)	($1.7)	($2.5)	($0.4)	379	986	891	465
AP South	Interface	500	($1.0)	($0.0)	($1.2)	($0.6)	441	39	639	237
East	Interface	500	$10.2	($0.7)	$1.6	($0.0)	1,371	148	324	11
Branchburg - Readington	Line	PSEG	$0.7	($0.5)	$2.2	($0.9)	457	239	704	480
Doubs - Mount Storm	Line	500	($3.7)	($1.9)	($1.0)	($0.1)	548	545	240	50
Conastone	Transformer	BGE	$0.0	$0.1	$0.6	$0.3	3	24	99	27

PSEG Control Zone

Table 7-23 shows the constraints with the largest impacts on total congestion cost in the PSEG Control Zone. In 2005, no facilities significantly contributed to negative congestion in the PSEG Control Zone. In 2005, the Cedar Grove–Clifton line, a PSEG Control Zone facility, and the 5004/5005 Interface constraints were the largest contributors to positive congestion. In 2006, the Cedar Grove–Clifton line made the most significant contribution to negative congestion and incurred significantly fewer congestion-event hours as compared to 2005. In 2006, the Cedar Grove–Roseland and 5004/5005 Interface constraints were the top contributors to positive congestion.

Table 7-23 PSEG Control Zone top congestion cost impacts (By facility): Calendar years 2005 to 2006

			Congestion Costs (Millions)				Event Hours			
			2005		2006		2005		2006	
Constraint	Type	Location	Day Ahead	Balancing	Day Ahead	Balancing	Day Ahead	Real Time	Day Ahead	Real Time
Cedar Grove - Roseland	Line	PSEG	$13.3	($4.8)	$28.5	($2.7)	1,371	544	3,692	541
5004/5005 Interface	Interface	500	$21.7	$1.7	$8.1	$1.6	1,906	782	1,738	341
Edison - Meadow Rd	Line	PSEG	$5.2	($0.0)	$9.0	($0.5)	636	256	875	634
Branchburg - Readington	Line	PSEG	$4.6	($0.7)	$10.0	($2.2)	457	239	704	480
Bergen - Hoboken	Line	PSEG	$8.6	($0.2)	$4.8	($0.1)	568	121	681	108
Cedar Grove - Clifton	Line	PSEG	$33.9	($0.9)	$1.3	($5.2)	2,880	266	168	536
Brunswick - Edison	Line	PSEG	$1.6	($0.0)	$3.3	($0.1)	174	89	464	206
Bergen - Leonia	Line	PSEG	$3.5	$0.3	$2.4	($0.0)	1,026	51	948	52
Whitpain	Transformer	PECO	$0.3	($0.1)	$1.8	$0.4	202	81	193	125
AP South	Interface	500	$1.4	($0.1)	$0.9	$1.2	441	39	639	237
Wylie Ridge	Transformer	AP	$7.5	($0.6)	$2.7	($0.8)	2,300	1,869	2,286	1,084
South Mahwah - Waldwick	Line	PSEG	$0.0	$0.0	$0.0	($1.6)	0	19	0	37
Bedington - Black Oak	Interface	500	$9.9	$0.2	$0.6	$0.8	4,569	1,924	3,875	1,812
Unclassified	Unclassified	NA	$4.0	$0.0	$1.4	$0.0	NA	NA	NA	NA
Bayway - Doremus	Line	PSEG	$0.0	$0.0	$1.4	$0.0	2	0	418	2

RECO Control Zone

Table 7-24 shows the constraints with the largest impacts on total congestion cost in the RECO Control Zone. In 2005, no facilities significantly contributed to negative congestion in the RECO Control Zone. In 2005, the Bedington–Black Oak and 5004/5005 Interface constraints were the largest contributors to positive congestion. In 2006, no facilities significantly contributed to negative congestion in the RECO Control Zone. In 2006, the Bedington–Black Oak Interface and the Cedar Grove–Roseland line were the top contributors to positive congestion.

Table 7-24 RECO Control Zone top congestion cost impacts (By facility): Calendar years 2005 to 2006

			Congestion Costs (Millions)				Event Hours			
			2005		2006		2005		2006	
Constraint	Type	Location	Day Ahead	Balancing	Day Ahead	Balancing	Day Ahead	Real Time	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$3.4	($0.1)	$2.3	$0.1	4,569	1,924	3,875	1,812
Cedar Grove - Roseland	Line	PSEG	$0.8	($0.7)	$1.7	($0.0)	1,371	544	3,692	541
5004/5005 Interface	Interface	500	$3.1	$0.0	$1.4	$0.2	1,906	782	1,738	341
West	Interface	500	$0.6	($0.1)	$0.7	$0.0	589	370	981	328
Kammer	Transformer	500	$2.3	($0.1)	$0.6	$0.0	3,414	1,749	2,043	688
Mount Storm - Pruntytown	Line	AP	$0.3	($0.2)	$0.6	($0.0)	379	986	891	465
AP South	Interface	500	$0.3	($0.0)	$0.4	$0.2	441	39	639	237
Central	Interface	500	$1.2	$0.0	$0.5	$0.0	1,261	67	699	15
Wylie Ridge	Transformer	AP	$1.2	($0.2)	$0.5	($0.0)	2,300	1,869	2,286	1,084
Branchburg - Readington	Line	PSEG	$0.2	($0.1)	$0.5	($0.1)	457	239	704	480
Kanawha - Matt Funk	Line	AEP	$0.1	($0.0)	$0.4	($0.0)	395	532	2,025	617
Cloverdale - Lexington	Line	AEP	$0.3	($0.1)	$0.3	($0.0)	1,107	679	1,517	961
Doubs - Mount Storm	Line	500	$0.8	($0.1)	$0.2	$0.0	548	545	240	50
Aqueduct - Doubs	Line	AP	$0.0	$0.0	$0.1	$0.0	14	0	362	127
Axton	Transformer	AEP	$0.0	$0.0	$0.1	($0.0)	16	0	218	35

Western Region Congestion-Event Summaries

AEP Control Zone

Table 7-25 shows the constraints with the largest impacts on total congestion cost in the AEP Control Zone. The largest contributions to negative congestion in 2005 came from the Cedar Grove–Roseland and Cloverdale–Lexington constraints. In 2005, the Kammer transformer and the Bedington–Black Oak Interface constraints were the largest contributors to positive congestion. The largest contribution to negative congestion in 2006 came from the Cloverdale–Lexington constraint. In 2006, as was the case in 2005, the Bedington–Black Oak Interface constraint was the largest contributor to positive congestion costs. The Kanawha–Matt Funk constraint increased significantly in both congestion cost and congestion-event hours and was the second largest contributor to positive congestion costs in 2006.

Table 7-25 AEP Control Zone top congestion cost impacts (By facility): Calendar years 2005 to 2006

			Congestion Costs (Millions)				Event Hours			
			2005		2006		2005		2006	
Constraint	Type	Location	Day Ahead	Balancing	Day Ahead	Balancing	Day Ahead	Real Time	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$87.6	($15.5)	$69.9	($12.9)	4,569	1,924	3,875	1,812
Kanawha - Matt Funk	Line	AEP	$19.1	($12.7)	$58.4	($11.5)	395	532	2,025	617
Kammer	Transformer	500	$72.6	($28.1)	$28.4	($3.6)	3,414	1,749	2,043	688
Axton	Transformer	AEP	$0.3	$0.0	$20.0	($0.5)	16	0	218	35
Mount Storm - Pruntytown	Line	AP	$9.3	($6.8)	$18.4	($1.8)	379	986	891	465
5004/5005 Interface	Interface	500	$18.4	($4.9)	$12.5	$0.1	1,906	782	1,738	341
Axton - Jacksons Ferry	Line	AEP	$1.2	($0.1)	$8.8	($0.1)	30	10	380	10
Cedar Grove - Roseland	Line	PSEG	$2.0	($11.1)	$8.8	($0.6)	1,371	544	3,692	541
Wylie Ridge	Transformer	AP	$18.7	($23.4)	$14.1	($6.6)	2,300	1,869	2,286	1,084
Cloverdale - Lexington	Line	AEP	($4.2)	($4.6)	($3.0)	($2.6)	1,107	679	1,517	961
Central	Interface	500	$5.3	($0.5)	$4.9	$0.0	1,261	67	699	15
AP South	Interface	500	$3.4	($0.4)	$5.3	($1.2)	441	39	639	237
Bedington	Transformer	AP	$0.8	($0.3)	$4.3	($0.6)	375	206	662	451
Breed - Wheatland	Line	AEP	$7.3	$0.0	$3.8	($0.3)	218	7	411	29
West	Interface	500	$2.9	($3.1)	$5.9	($2.5)	589	370	981	328

AP Control Zone

Table 7-26 shows the constraints with the largest impacts on total congestion cost in the AP Control Zone. In 2005, the Kammer and Wylie Ridge transformers contributed significantly to negative congestion while the Bedington–Black Oak Interface and Doubs transformer contributed to positive congestion. In 2006, the Kammer transformer was again the top contributor to negative congestion followed by the Aqueduct–Doubs constraint. The Bedington–Black Oak Interface and Meadow Brook transformer constraints were the top contributors to positive congestion in 2006.

Table 7-26 AP Control Zone top congestion cost impacts (By facility): Calendar years 2005 to 2006

			Congestion Costs (Millions)				Event Hours			
			2005		2006		2005		2006	
Constraint	Type	Location	Day Ahead	Balancing	Day Ahead	Balancing	Day Ahead	Real Time	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$218.6	($3.9)	$177.8	($9.4)	4,569	1,924	3,875	1,812
Meadow Brook	Transformer	AP	$35.5	($0.4)	$38.9	$0.5	633	220	726	124
Mount Storm - Pruntytown	Line	AP	$18.0	($2.9)	$39.2	$0.1	379	986	891	465
Bedington	Transformer	AP	$12.9	($0.6)	$30.8	($3.1)	375	206	662	451
AP South	Interface	500	$14.7	($0.1)	$21.5	($1.6)	441	39	639	237
Doubs	Transformer	AP	$75.3	($2.0)	$14.0	$0.2	1,007	686	90	74
Kammer	Transformer	500	($19.3)	($0.0)	($12.1)	($0.7)	3,414	1,749	2,043	688
Cloverdale - Lexington	Line	AEP	$11.8	($1.2)	$14.1	($3.9)	1,107	679	1,517	961
Aqueduct - Doubs	Line	AP	($0.0)	$0.0	($9.8)	($0.0)	14	0	362	127
Kanawha - Matt Funk	Line	AEP	$6.5	($0.8)	$9.7	($1.4)	395	532	2,025	617
Doubs - Mount Storm	Line	500	$34.4	($7.6)	$8.0	($1.0)	548	545	240	50
Wylie Ridge	Transformer	AP	($1.6)	($9.3)	($0.6)	($6.3)	2,300	1,869	2,286	1,084
Cedar Grove - Roseland	Line	PSEG	$4.9	($0.4)	$5.6	$0.2	1,371	544	3,692	541
Branchburg - Readington	Line	PSEG	$0.2	($1.7)	$1.1	($4.7)	457	239	704	480
Fort Martin - Pruntytown	Line	500	$7.7	($0.0)	$3.4	($0.3)	136	21	111	22

ComEd Control Zone

Table 7-27 shows the constraints with the largest impacts on total congestion cost in the ComEd Control Zone. In 2005, no facilities significantly contributed to negative congestion in the ComEd Control Zone. In 2005, the Kammer and Wylie Ridge transformer constraints were the largest contributors to positive congestion. The only significant contribution to negative congestion in 2006 came from the Northwest–Devon line, a ComEd Control Zone facility. In 2006, the Kammer transformer and the Cloverdale–Lexington line constraints were the top contributors to positive congestion.

Table 7-27 ComEd Control Zone top congestion cost impacts (By facility): Calendar years 2005 to 2006

			Congestion Costs (Millions)				Event Hours			
			2005		2006		2005		2006	
Constraint	Type	Location	Day Ahead	Balancing	Day Ahead	Balancing	Day Ahead	Real Time	Day Ahead	Real Time
Kammer	Transformer	500	$15.0	$33.5	$5.8	$9.6	3,414	1,749	2,043	688
Cloverdale - Lexington	Line	AEP	$1.7	$4.0	$6.5	$7.0	1,107	679	1,517	961
Wylie Ridge	Transformer	AP	$4.8	$17.4	$4.2	$8.6	2,300	1,869	2,286	1,084
Bedington - Black Oak	Interface	500	$0.5	$8.2	$3.9	$8.5	4,569	1,924	3,875	1,812
Cedar Grove - Roseland	Line	PSEG	$2.5	$9.1	$6.9	$2.4	1,371	544	3,692	541
Branchburg - Readington	Line	PSEG	$0.4	$4.2	$0.7	$6.8	457	239	704	480
Kanawha - Matt Funk	Line	AEP	$0.9	$2.9	$1.6	$5.5	395	532	2,025	617
Cherry Valley - Belvidere	Line	ComEd	$1.1	$0.1	$6.4	($0.2)	30	14	39	12
5004/5005 Interface	Interface	500	$1.7	$7.2	$4.6	$0.8	1,906	782	1,738	341
Jefferson - Taylor	Line	ComEd	$0.0	$0.0	$4.6	$0.6	2	0	137	11
Dresden	Transformer	ComEd	$0.0	($0.0)	$4.7	$0.3	0	93	64	18
West	Interface	500	$1.5	$4.6	$0.9	$4.0	589	370	981	328
Oak Park - Ridgeland	Line	ComEd	$0.0	$0.0	$4.1	$0.0	5	0	338	0
AP South	Interface	500	$0.7	$0.4	$1.6	$2.1	441	39	639	237
Northwest - Devon	Line	ComEd	$0.0	($0.1)	$0.2	($3.4)	0	8	17	52

DAY Control Zone

Table 7-28 shows the constraints with the largest impacts on total congestion cost in the DAY Control Zone. Negative contributions to congestion in 2005 came from the Doubs–Mount Storm line and the Avon transformer constraints. In 2005, the Kammer transformer and the 5004/5005 Interface constraints were the largest contributors to positive congestion. Neither of these facilities is located in the DAY Control Zone. The Avon transformer increased in congestion frequency in 2006 as compared to 2005 and was the largest contributor to negative congestion in 2006. In 2006, the Kammer transformer constraint was the top contributor to positive congestion costs followed by the Cedar Grove–Roseland and Cloverdale–Lexington line constraints.

Table 7-28 DAY Control Zone top congestion cost impacts (By facility): Calendar years 2005 to 2006

			Congestion Costs (Millions)				Event Hours			
			2005		2006		2005		2006	
Constraint	Type	Location	Day Ahead	Balancing	Day Ahead	Balancing	Day Ahead	Real Time	Day Ahead	Real Time
Kammer	Transformer	500	$9.0	($4.3)	$3.2	($0.6)	3,414	1,749	2,043	688
Cedar Grove - Roseland	Line	PSEG	$1.2	($1.2)	$2.5	($0.3)	1,371	544	3,692	541
Cloverdale - Lexington	Line	AEP	$0.8	($0.5)	$2.1	($0.0)	1,107	679	1,517	961
5004/5005 Interface	Interface	500	$3.4	($0.8)	$2.5	($0.5)	1,906	782	1,738	341
Avon	Transformer	AEP	$0.0	($0.4)	$0.0	($1.4)	0	110	0	229
Kanawha - Matt Funk	Line	AEP	$0.7	($0.7)	$1.8	($0.7)	395	532	2,025	617
West	Interface	500	$1.7	($0.3)	$1.4	($0.5)	589	370	981	328
Marquis - Killen	Line	AEP	$0.0	$0.0	$0.9	$0.0	0	0	288	0
Central	Interface	500	$1.8	$0.0	$0.8	($0.0)	1,261	67	699	15
Meadow Brook	Transformer	AP	$0.0	($0.0)	$0.4	($0.0)	633	220	726	124
Doubs - Mount Storm	Line	500	$0.6	($0.8)	$0.4	$0.0	548	545	240	50
Cloverdale	Transformer	AEP	$0.2	$0.0	$0.3	$0.0	192	0	221	34
East	Interface	500	$1.1	($0.1)	$0.3	($0.0)	1,371	148	324	11
AP South	Interface	500	$0.7	($0.1)	$0.5	($0.2)	441	39	639	237
Axton	Transformer	AEP	$0.0	$0.0	$0.3	($0.1)	16	0	218	35

DLCO Control Zone

Table 7-29 shows the constraints with the largest impacts on total congestion cost in the DLCO Control Zone. Negative contributions to congestion in 2005 came from two AP Control Zone facilities, the Elrama–Mitchell and Mount Storm–Pruntytown lines. In 2005, the Bedington–Black Oak Interface and Wylie Ridge transformer constraints were the largest contributors to positive congestion. Neither of these facilities is located in the DLCO Control Zone. In 2006, the Elrama–Mitchell line was again a significant contributor to negative congestion along with the Sammis–Wylie Ridge line. The Bedington–Black Oak Interface, Cedar Grove–Roseland line and Wylie Ridge transformer constraints were the most significant contributors to positive congestion in 2006.

Table 7-29 DLCO Control Zone top congestion cost impacts (By facility): Calendar years 2005 to 2006

			Congestion Costs (Millions)				Event Hours			
			2005		2006		2005		2006	
Constraint	Type	Location	Day Ahead	Balancing	Day Ahead	Balancing	Day Ahead	Real Time	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$15.5	($6.7)	$10.3	($5.1)	4,569	1,924	3,875	1,812
Cedar Grove - Roseland	Line	PSEG	$2.6	($3.6)	$5.0	($0.9)	1,371	544	3,692	541
Wylie Ridge	Transformer	AP	$18.3	($10.2)	$8.4	($4.9)	2,300	1,869	2,286	1,084
5004/5005 Interface	Interface	500	$10.8	($4.1)	$3.5	($0.5)	1,906	782	1,738	341
West	Interface	500	$3.3	($1.4)	$3.4	($0.9)	589	370	981	328
Mount Storm - Pruntytown	Line	AP	$1.6	($3.2)	$2.5	($0.7)	379	986	891	465
Kammer	Transformer	500	$5.6	($0.7)	$1.8	($0.3)	3,414	1,749	2,043	688
Sammis - Wylie Ridge	Line	AP	($0.1)	($0.4)	$0.0	($1.3)	5	67	0	125
Cheswick - Evergreen	Line	DLCO	$0.0	$0.0	$1.2	($0.0)	0	1	167	45
Crescent	Transformer	DLCO	$0.0	$0.1	$0.0	$0.9	0	22	0	23
Central	Interface	500	$4.0	($0.2)	$0.9	($0.0)	1,261	67	699	15
Elrama	Transformer	AP	$0.5	($0.0)	$0.9	($0.0)	285	61	927	34
Kanawha - Matt Funk	Line	AEP	$0.6	($0.3)	$1.2	($0.4)	395	532	2,025	617
Elrama - Mitchell	Line	AP	$0.6	($2.5)	$1.2	($1.9)	230	244	654	258
Branchburg - Readington	Line	PSEG	$0.6	($1.1)	$1.7	($1.0)	457	239	704	480

Southern Region Congestion-Event Summaries

Dominion Control Zone

Table 7-30 shows the constraints with the largest impacts on total congestion cost in the Dominion Control Zone. In 2005, the Mount Storm–Pruntytown constraint contributed significantly to negative congestion while the Bedington–Black Oak Interface, Doubs–Mount Storm line and AP South Interface constraints contributed to positive congestion. In 2006, the Cedar Grove–Roseland constraint contributed significantly to negative congestion. The AP South Interface constraint increased in both congestion costs and congestion-event hours and was the second largest contributor to positive congestion in 2006 in the Dominion Control Zone. The largest contribution to positive congestion costs in 2006 in the Dominion Control Zone came from the Bedington–Black Oak Interface constraint.

Table 7-30 Dominion Control Zone top congestion cost impacts (By facility): Phase 5, 2005 to December 31, 2006

			Congestion Costs (Millions)				Event Hours			
			2005		2006		2005		2006	
Constraint	Type	Location	Day Ahead	Balancing	Day Ahead	Balancing	Day Ahead	Real Time	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$77.3	($15.0)	$70.4	($6.0)	4,569	1,924	3,875	1,812
AP South	Interface	500	$22.1	($0.4)	$28.0	$1.6	441	39	639	237
Cloverdale - Lexington	Line	AEP	$9.8	($6.7)	$35.3	($7.8)	1,107	679	1,517	961
Doubs - Mount Storm	Line	500	$54.1	($1.5)	$15.2	($0.4)	548	545	240	50
Cedar Grove - Roseland	Line	PSEG	($6.1)	$2.7	($11.5)	($1.5)	1,371	544	3,692	541
Meadow Brook	Transformer	AP	$13.7	($1.3)	$13.2	($0.2)	633	220	726	124
Kanawha - Matt Funk	Line	AEP	$6.7	($10.3)	$19.5	($9.8)	395	532	2,025	617
Aqueduct - Doubs	Line	AP	$0.0	$0.0	$9.2	$0.5	14	0	362	127
Dooms	Transformer	Dominion	$0.9	$0.3	$9.9	($0.6)	22	31	150	147
Doubs	Transformer	AP	$20.5	$1.0	$6.8	$0.1	1,007	686	90	74
5004/5005 Interface	Interface	500	$5.5	$1.1	$4.5	$0.9	1,906	782	1,738	341
Kammer	Transformer	500	$5.6	($3.6)	$8.1	($2.9)	3,414	1,749	2,043	688
Mount Storm - Pruntytown	Line	AP	$5.5	($13.6)	$6.5	($1.4)	379	986	891	465
Cloverdale	Transformer	AEP	$3.3	$0.0	$5.6	($0.5)	192	0	221	34
Dayton - Harrisonburg	Line	Dominion	$0.9	$0.0	$4.6	$0.0	27	0	74	0

Economic Planning Process

On September 8, 2006, PJM filed proposed changes to its RTEP Protocol.[23] PJM proposed modifications to the metrics used to determine whether transmission should be upgraded or expanded. On November 21, 2006, the United States Federal Energy Regulatory Commission (FERC) conditionally accepted PJM's proposal subject to PJM submitting a compliance filing within 120 days of its order.[24]

PJM's current planning process for economic transmission expansions is based on the concept of unhedgeable congestion.[25] In its September 8th filing, PJM proposed the replacement of the unhedgeable congestion metric for determining whether transmission should be upgraded or expanded with a set of congestion metrics including unhedgeable congestion. These metrics include: total production costs; total load payments; total generator revenue; zonal load payments; zonal FTR credits; total transmission system losses; and total capacity payments.[26] PJM will perform market simulations to compare the costs and benefits of the proposed transmission projects.

The metrics will be applied to evaluating all types of transmission projects, including whether to modify or accelerate reliability enhancements already in the RTEP that could also relieve one or more economic constraints and whether to propose new, economic transmission projects that could relieve one or more economic constraints. PJM will also evaluate whether demand response resources or new generation could eliminate the need for an economic upgrade. After PJM makes an evaluation, it will present its analysis to the stakeholders (Transmission Expansion Advisory Committee), which will, in turn, present its recommendations to the PJM Board.

The proposed economic planning revisions incorporate improvements over the existing process but require ongoing development. The most significant improvements are the inclusion of more appropriate analytical metrics, the consideration of forecasts and the evaluation of demand-side response and generation resources as competitive alternatives to transmission investment. The approach to weighting and evaluating the metrics in the context of actual transmission projects will require substantial effort. New transmission projects, and the lack of existing transmission, can have significant impacts on the PJM markets and the goal of transmission planning should ultimately be the incorporation of transmission investment decisions into market-driven processes as much as is practicable.

23 *PJM Interconnection, L.L.C.*, PJM Interconnection, L.L.C. submits modifications to its Regional Transmission Expansion Planning Protocol, Docket No. ER06-1474-000 (September 8, 2006).

24 117 FERC ¶ 61,218.

25 PJM divides transmission expansions into reliability and economic categories. Reliability expansions are those needed to ensure that load can be met reliably. Economic expansions (also called "market efficiency" expansions) are those that will reduce the costs of meeting load but are not needed to meet load reliably.

26 PJM defines "economic constraints" as including, but not limited to, constraints that cause: (i) significant historical gross congestion; (ii) significant historical unhedgeable congestion; (iii) proration of ARR requests; or (iv) significant congestion as forecast in the market efficiency analysis.