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]

The Market Monitoring Unit (MMU) analyzed congestion and its influence on PJM markets during 2007. In doing so, comparison to 2006 and certain other prior years was required.[3]

Overview

Congestion Cost

- Total Congestion. Total congestion costs increased by $241 million or 15 percent, from $1.603 billion in calendar year 2006 to $1.845 billion in calendar year 2007. Day-ahead congestion costs increased by $368 million or 22 percent, from $1.707 billion in calendar year 2006 to $2.075 billion in calendar year 2007. Balancing congestion costs decreased by $126 million or 122 percent, from -$104 million in calendar year 2006 to -$230 million in calendar year 2007. Total congestion costs have ranged from 6 percent to 9 percent of PJM annual total billings since 2003. Congestion costs were 6 percent of total PJM billings for 2007, compared to 8 percent in 2006. Total PJM billings for 2007 were $30.556 billion, a 46 percent increase from the $20.945 billion billed in 2006.

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 the *2007 State of the Market Report*, Volume II, Section 8, "Financial Transmission and Auction Revenue Rights," at "ARR and FTR Revenue and Congestion."

3 During calendar years 2004 and 2005, PJM conducted the phased integration of five control zones: ComEd, American Electric Power (AEP), The Dayton Power & Light Company (DAY), Duquesne Light Company (DLCO) and Dominion. By convention, control zones bear the name of a large utility service provider working within their boundaries. The nomenclature applies to the geographic area, not to any single company. For additional information on the integrations, their timing and their impact on the footprint of the PJM service territory, see the *2007 State of the Market Report*, Volume II, Appendix A, "PJM Geography."

- Monthly Congestion. Fluctuations in monthly congestion costs continued to be substantial. In 2007, 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.

Congestion Component of LMP and Facility or Zonal Congestion

- Congestion Component of Locational Marginal Price (LMP). To provide an indication of the geographic dispersion of congestion costs, the congestion component of LMP (CLMP) was calculated for control zones in PJM. Price separation between eastern and western control zones in PJM was primarily a result of congestion on the Bedington — Black Oak and 5004/5005 interfaces. 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 2006, congestion frequency was significantly higher in the Day-Ahead Market compared to the Real-Time Market in 2007.[4] Day-ahead congestion frequency increased in calendar year 2007 compared to 2006. In 2007, there were 62,216 day-ahead, congestion-event hours compared to 56,299 congestion-event hours in 2006. Day-ahead, congestion-event hours increased on Midwest Independent Transmission System Operator, Inc. (Midwest ISO) flowgates, interfaces and lines while congestion frequency on transformers decreased in 2007 compared to 2006. Real-time congestion frequency increased in calendar year 2007 compared to 2006. In 2007, there were 19,527 real-time, congestion-event hours compared to 19,510 congestion-event hours in 2006. Real-time, congestion-event hours increased on Midwest ISO flowgates, interfaces and transformers, while lines saw decreases. The Bedington — Black Oak Interface was the largest contributor to congestion costs in both 2006 and 2007. With $714 million in total congestion costs, it accounted for 39 percent of the total PJM congestion costs in 2007. The top four constraints in terms of congestion costs together contributed $1.159 billion, or 63 percent, of the total PJM congestion costs in 2007. The top four constraints also included the Cloverdale — Lexington line and the 5004/5005 and AP South interfaces.

- Zonal Congestion. In calendar year 2007, the AP Control Zone experienced the highest congestion cost of any control zone in PJM. The $448.6 million in congestion costs in the AP Control Zone represented a 32 percent increase from the $340.1 million in congestion costs the zone had experienced in 2006. The Bedington — Black Oak Interface and the Cloverdale — Lexington line constraints together contributed $286.9 million, or 64 percent of the total AP Control Zone congestion cost. The Dominion Control Zone had the second highest congestion cost in PJM in 2007. The $290.8 million in congestion costs in the Dominion Control Zone represented a 29 percent increase from the $224.7 million in congestion costs the zone had experienced in 2006. The Bedington — Black Oak Interface and Cloverdale — Lexington line constraints together contributed $185.5 million, or 64 percent of the total Dominion Control Zone congestion cost.

4 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 *2007 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.

Economic Planning Process

- Process Revision. PJM has made multiple filings related to economic metrics for evaluating transmission investments. The United States Federal Energy Regulatory Commission (FERC) has required that PJM use an approach with predefined formulas for determining whether a defined transmission investment passes the cost-benefit test including explicit accounting for changes in production costs, the costs of complying with environmental regulations, generation availability trends and demand-response trends. On October 9, 2007, PJM submitted its compliance filing to address these issues and to provide a formulaic approach for including transmission projects in the Regional Transmission Expansion Plan (RTEP). Under PJM's proposed approach, PJM would perform market simulations with and without the proposed transmission investments, including reliability-based investments and economic investments. The result would be used to determine the economic benefits of the investments and whether to include such investment in the RTEP. An economic investment would be included in the RTEP if the relative benefits and costs of the investment meet a benefit/cost ratio threshold of at least 1.25:1.

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 increased by $241 million or 15 percent, from $1.603 billion in calendar year 2006 to $1.845 billion in calendar year 2007. Day-ahead congestion costs increased by $368 million or 22 percent, from $1,707 billion in calendar year 2006 to $2.075 billion in calendar year 2007. Balancing congestion costs decreased by $126 million or 122 percent, from -$104 million in calendar year 2006 to -$230 million in calendar year 2007. 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 2007, there were 62,216 congestion-event hours compared to 56,299 congestion-event hours in 2006. In the Real-Time Energy Market in 2007, there were 19,527 congestion-event hours compared to 19,510 congestion-event hours in 2006.

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, is an essential input to a rational market and planning process.

ARRs and FTRs served as an effective hedge against congestion. In total, ARR and FTR revenues hedged 98.4 percent of congestion costs in the Day-Ahead Energy Market and in the balancing energy market within PJM for the 2006 to 2007 planning period and 92.3 percent of the congestion costs in PJM in the first seven months of the 2007 to 2008 planning period.[5] FTRs were paid at 100 percent of their target allocation for the planning year ended May 31, 2007, and at 100 percent of their target allocation for the first seven months of the current planning year.

5 See the *2007 State of the Market Report*, Volume II, Section 8, "Financial Transmission and Auction Revenue Rights," at Table 8-22, "ARR and FTR congestion hedging: Planning periods 2006 to 2007 and 2007 to 2008."

One constraint accounted for over a third of total congestion costs in 2007 and the top four constraints accounted for nearly two-thirds 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 2007 and 2006 and, with $714 million in total congestion costs, accounted for 39 percent of the total PJM congestion costs in 2007. The top four constraints in terms of congestion costs together accounted for 63 percent of the total PJM congestion costs in 2007.

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 equal to the load congestion payments minus generation congestion credits, plus explicit congestion charges, incurred in both the Day-Ahead Energy Market and the balancing energy market.

- Day-Ahead Load Congestion Payments. Day-ahead load congestion payments are calculated for all cleared demand, decrement bids and Day-Ahead Energy Market sale transactions. (Decrement bids and energy sales can be thought of as scheduled load.) Day-ahead load congestion payments are calculated using MW and the load bus CLMP, the decrement bid CLMP or the CLMP at the source of the sale transaction, as applicable.

- Day-Ahead Generation Congestion Credits. Day-ahead generation congestion credits are calculated for all cleared generation and increment offers and Day-Ahead Energy Market purchase transactions. (Increment offers and energy purchases can be thought of as scheduled generation.) Day-ahead generation congestion credits are calculated using MW and the generator bus CLMP, the increment offer's CLMP or the CLMP at the sink of the purchase transaction, as applicable.

- Balancing Load Congestion Payments. Balancing load congestion payments are calculated for all deviations between a PJM member's real-time load and energy sale transactions and their day-ahead cleared demand, decrement bids and energy sale transactions. Balancing load congestion payments are calculated using MW deviations and the real-time CLMP for each bus where a deviation exists.

- Balancing Generation Congestion Credits. Balancing generation congestion credits are calculated for all deviations between a PJM member's real-time generation and energy purchase transactions and the day-ahead cleared generation, increment offers and energy purchase transactions. Balancing generation congestion credits are calculated using MW deviations and the real-time CLMP for each bus where a deviation exists.

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 documents by PJM's Market Settlement Operations.

- 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 CLMP 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 CLMP at the transactions' sources and sinks.

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.

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, excluding losses. 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, excluding losses, 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

Congestion charges are comprised of hourly congestion revenue and net negative congestion. Congestion charges have ranged from 6 percent to 9 percent of annual total PJM billings since 2003.[7] Table 7-1 shows total congestion by year from 2003 through 2007. Total congestion charges were $1.845 billion in calendar year 2007, a 15 percent increase from $1.603 billion in calendar year 2006.

Table 7-1 Total annual PJM congestion (Dollars (Millions)): Calendar years 2003 to 2007

	Congestion Charges	Percent Change	Total PJM Billing	Percent of PJM Billing
2003	$464	NA	$6,900	7%
2004	$750	62%	$8,700	9%
2005	$2,092	179%	$22,630	9%
2006	$1,603	(23%)	$20,945	8%
2007	$1,845	15%	$30,556	6%
Total	$6,754		$89,731	8%

Total congestion charges appearing in Table 7-1 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.[8]

7 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.

8 See "Joint Operating Agreement Between the Midwest Independent Transmission System Operator, Inc. And PJM Interconnection, L.L.C." (February 5, 2008) (Accessed February 5, 2008), Section 6.1 < http://www.pjm.com/documents/downloads/agreements/joa-complete.pdf> (1,034 KB).

Monthly Congestion

Table 7-2 shows that during calendar year 2007, monthly congestion charges ranged from a maximum of $226 million in December 2007 to a minimum of $90 million in May 2007. Approximately 23 percent of all calendar year 2007 congestion occurred in the months of August and December.

Table 7-2 Monthly PJM congestion charges (Dollars (Millions)): Calendar years 2006 to 2007

	Total Congestion Charges	
	2006	2007
Jan	$155	$112
Feb	$159	$175
Mar	$94	$159
Apr	$49	$109
May	$68	$90
Jun	$159	$188
Jul	$295	$205
Aug	$376	$207
Sept	$69	$136
Oct	$41	$122
Nov	$46	$117
Dec	$91	$226

Congestion Component of LMP

The congestion component of LMP was calculated for each PJM control zone, to provide an indication of the geographic dispersion of congestion costs. The congestion component of LMP for control zones is presented in Table 7-3 for calendar years 2006 and 2007.

Table 7-3 shows overall congestion patterns in 2007. Price separation between eastern and western control zones in PJM was primarily a result of congestion on the Bedington — Black Oak and 5004/5005 interfaces. These constraints generally had a positive congestion component of LMP in eastern control zones located on the constrained side of the affected facilities while the unconstrained western zones had a negative congestion component of LMP.

Table 7-3 Annual average congestion component of LMP: Calendar years 2006 to 2007

	2006		2007	
Control Zone	Day Ahead	Real Time	Day Ahead	Real Time
AECO	$8.13	$8.34	$6.27	$6.42
AEP	($5.06)	($4.95)	($7.59)	($8.80)
AP	$0.88	$1.52	$0.77	$1.33
BGE	$9.06	$10.21	$9.50	$12.08
ComEd	($5.41)	($5.67)	($7.80)	($9.42)
DAY	($6.12)	($5.98)	($8.12)	($9.54)
DLCO	($7.49)	($7.85)	($9.22)	($11.13)
DPL	$6.54	$5.90	$5.72	$6.09
Dominion	$8.13	$9.25	$8.42	$9.89
JCPL	$4.78	$4.61	$6.49	$7.36
Met-Ed	$6.19	$5.47	$6.24	$7.32
PECO	$6.01	$5.21	$5.01	$4.82
PENELEC	($0.37)	($0.55)	($1.14)	($1.46)
PPL	$5.03	$4.33	$4.75	$4.89
PSEG	$7.23	$7.38	$7.05	$7.43
Pepco	$10.33	$11.66	$10.83	$13.00
RECO	$7.18	$6.69	$6.77	$6.50

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. In 2007, there were 62,216 day-ahead, congestion-event hours, an increase of 10.5 percent from the 56,299 in 2006. In 2007, there were 19,527 real-time, congestion-event hours, a 0.09 percent increase from the 19,510 in 2006.

Congestion by Facility Type and Voltage

Both day-ahead and real-time, congestion-event hours increased on the Midwest ISO flowgates and interfaces in 2007. Day-ahead, congestion-event hours increased on lines while real-time, congestion-event hours decreased on lines. Day-ahead, congestion-event hours decreased on transformers and real-time, congestion-event hours increased on transformers.

Day-ahead congestion costs increased on all facility types in 2007 except unclassified.[9] Balancing congestion costs decreased on all facility types in 2007.

Table 7-4 provides congestion-event-hour subtotals and congestion cost subtotals comparing 2007 calendar year results by facility type: line, transformer, interface, flowgate and unclassified facilities.[10] For comparison, this information is presented in Table 7-5 for calendar year 2006.

Total congestion costs associated with Midwest ISO flowgates was unchanged from 2006 at -$6 million. The Crete — St. Johns Tap and Tower Road flowgates together accounted for $0.5 million in congestion costs and were the largest contributors to positive congestion costs among Midwest ISO flowgates in 2007. The largest contribution to negative congestion costs among Midwest ISO flowgates came from the State Line — Wolf Lake flowgate with -$2.2 million in 2007 congestion costs.

Total congestion costs associated with interfaces increased 30 percent from $764 million in 2006 to $991.1 million in 2007. Interfaces typically include multiple transmission facilities and reflect power flows into or through a wider geographic area. Interface congestion constituted 54 percent of total PJM congestion costs in 2007. Among interfaces, the Bedington — Black Oak and 5004/5005 interfaces accounted for the largest contribution to positive congestion costs in 2007. Bedington — Black Oak, with $714 million in congestion, had the highest congestion cost of any facility in PJM, accounting for 39 percent of the total PJM congestion costs in 2007. The Bedington — Black Oak and 5004/5005 interfaces together accounted for $830.5 million or 45 percent of total PJM congestion costs in 2007. The largest contribution to negative congestion costs among interface constraints was the PL North Interface with -$2.4 million in 2007.

Total congestion costs associated with lines increased 5 percent from $495.8 million in 2006 to $521.6 million in 2007. Line congestion accounted for 28 percent of the total PJM congestion costs for 2007. The Cloverdale — Lexington, Branchburg — Readington and Atlantic — Larrabee lines together accounted for $313.3 million or 60 percent of all line congestion costs and were the largest contributors to positive congestion among lines in 2007. The largest contribution to negative congestion among lines came from the Darwin — Eugene line with -$12.6 million in 2007.

Total congestion costs associated with transformers decreased 3 percent from $334.6 million in 2006 to $325.4 million in 2007. Congestion on transformers accounted for 18 percent of the total PJM congestion costs in 2007. The Kammer and Bedington transformers together accounted for $124 million or 38 percent of all transformer congestion costs and were the largest contributors to positive congestion costs among transformers in 2007. The largest contribution to negative congestion among transformers came from the Dumont transformer in the AEP Control Zone with -$0.9 million in 2007.

9 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.

10 The term *flowgate* refers to Midwest ISO flowgates in this context.

Table 7-4 Congestion summary (By facility type): Calendar year 2007

Congestion Costs (Millions)											
	Day Ahead				Balancing					Event Hours	
Type	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Flowgate	($10.4)	($14.9)	$4.4	$9.0	($19.6)	($19.0)	($14.4)	($15.0)	($6.0)	1,489	1,069
Interface	$440.8	($528.1)	$58.8	$1,027.7	$466.7	$483.9	($19.3)	($36.6)	$991.1	9,798	2,856
Line	($295.8)	($901.3)	$67.6	$673.1	$71.4	$121.5	($101.4)	($151.5)	$521.6	39,071	10,916
Transformer	$128.0	($192.3)	$32.1	$352.4	($34.5)	($31.9)	($24.3)	($27.0)	$325.4	11,858	4,686
Unclassified	$12.2	$1.1	$1.3	$12.4	$0.0	$0.0	$0.0	$0.0	$12.4	NA	NA
Total	$274.9	($1,635.5)	$164.2	$2,074.6	$484.0	$554.6	($159.5)	($230.1)	$1,844.5	62,216	19,527

Table 7-5 Congestion summary (By facility type): Calendar year 2006

Congestion Costs (Millions)											
	Day Ahead				Balancing					Event Hours	
Type	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Flowgate	($15.2)	($18.4)	$2.0	$5.2	($19.3)	($18.2)	($10.0)	($11.2)	($6.0)	1,350	859
Interface	$1,459.1	$726.8	$20.1	$752.4	$1,302.3	$1,284.5	($6.2)	$11.6	$764.0	8,273	2,792
Line	($94.3)	($645.5)	$34.3	$585.5	$235.5	$286.4	($38.7)	($89.6)	$495.8	34,558	11,447
Transformer	$391.9	$59.1	$16.4	$349.2	$471.8	$468.7	($17.6)	($14.6)	$334.6	12,118	4,412
Unclassified	$25.8	$13.8	$3.0	$14.9	$0.0	$0.0	$0.0	$0.0	$14.9	NA	NA
Total	$1,767.2	$135.9	$75.8	$1,707.1	$1,990.3	$2,021.5	($72.6)	($103.8)	$1,603.4	56,299	19,510

Table 7-6 shows congestion costs by facility voltage class. In comparison to 2006 (shown in Table 7-7), congestion costs decreased across 765 kV, 345 kV, 69 kV and unclassified class facilities in 2007. Congestion costs increased across 500 kV, 230 kV, 138 kV, 115 kV and 12 kV class facilities in 2007.

Congestion costs associated with 765 kV facilities decreased 58 percent from $16.7 million in 2006 to the $7.0 million experienced in 2007. Congestion on 765 kV facilities comprised less than 1 percent of total 2007 PJM congestion costs. The Axton — Jackson's Ferry line accounted for $5.9 million or 84 percent of all 765 kV congestion costs and was the largest contributor to positive congestion among 765 kV facilities in 2007. The Dumont — Wilton Center line was the largest contributor to negative congestion among 765 kV facilities with -$0.7 million in 2007.

Congestion costs associated with 500 kV facilities increased 26 percent from $1.023 billion in 2006 to $1.288 billion in 2007. Congestion on 500 kV facilities comprised 70 percent of total 2007 PJM congestion costs. The Bedington — Black Oak Interface and the Cloverdale — Lexington line together accounted for $941.1 million or 73 percent of all 500 kV congestion costs; they were the largest contributors to positive congestion among 500 kV facilities in 2007. The Bristers — Ox line was the largest contributor to negative congestion among 500 kV facilities with -$1.1 million in 2007.

Congestion costs associated with 230 kV facilities increased 35 percent from $166.7 million in 2006 to $225.8 million in 2007. Congestion on 230 kV facilities comprised 12 percent of total 2007 PJM congestion costs. The Branchburg — Readington line accounted for $63.1 million or 28 percent of all 230 kV congestion costs and was the largest contributor to positive congestion among 230 kV facilities in 2007. The largest contribution to negative congestion among 230 kV facilities came from the PL North Interface with -$2.4 million in 2007.

Congestion costs associated with 138 kV facilities increased 20 percent from $181.7 million in 2006 to $218.9 million in 2007. Congestion on 138 kV facilities comprised 12 percent of total 2007 PJM congestion costs. The Bedington and Meadow Brook transformers together accounted for $104.6 million or 48 percent of all 138 kV congestion costs and were the largest contributors to positive congestion among 138 kV facilities in 2007. The largest contribution to negative congestion among 138 kV facilities came from the State Line — Wolf Lake line with -$2.2 million in 2007.

Table 7-6 Congestion summary (By facility voltage): Calendar year 2007

Congestion Costs (Millions)											
	Day Ahead				Balancing					Event Hours	
Voltage (kV)	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
765	($3.4)	($10.0)	$1.3	$7.8	($0.3)	($0.1)	($0.6)	($0.8)	$7.0	422	17
500	$609.5	($617.7)	$93.7	$1,320.9	$671.5	$653.9	($50.2)	($32.6)	$1,288.3	15,691	5,938
345	$76.2	$2.1	$18.1	$92.2	$94.9	$113.9	($50.6)	($69.6)	$22.6	3,719	1,973
230	($496.6)	($759.7)	$18.0	$281.1	($259.1)	($226.2)	($22.4)	($55.3)	$225.8	11,927	3,141
138	$26.5	($212.4)	$30.0	$268.9	($7.8)	$4.2	($37.9)	($50.0)	$218.9	16,569	5,313
115	$39.7	($19.8)	$1.5	$61.1	($20.3)	($1.9)	$2.4	($16.0)	$45.1	6,337	1,916
69	$11.0	($19.0)	$0.2	$30.2	$5.1	$10.8	($0.2)	($5.9)	$24.3	7,434	1,229
12	($0.1)	($0.1)	$0.0	$0.1	$0.0	$0.0	$0.0	$0.0	$0.1	117	0
Unclassified	$12.2	$1.1	$1.3	$12.4	$0.0	$0.0	$0.0	$0.0	$12.4	NA	NA
Total	$274.9	($1,635.5)	$164.2	$2,074.6	$484.0	$554.6	($159.5)	($230.1)	$1,844.5	62,216	19,527

Table 7-7 Congestion summary (By facility voltage): Calendar year 2006

Congestion Costs (Millions)											
	Day Ahead				Balancing					Event Hours	
Voltage (kV)	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
765	$35.1	$20.2	$2.0	$16.9	$10.2	$10.7	$0.3	($0.2)	$16.7	574	41
500	$2,061.9	$1,087.1	$32.7	$1,007.5	$1,850.8	$1,819.3	($16.3)	$15.2	$1,022.7	13,170	5,028
345	$336.5	$171.9	$13.3	$177.9	$121.6	$147.3	($19.0)	($44.7)	$133.2	5,949	2,481
230	($864.1)	($1,043.3)	$14.1	$193.3	($251.5)	($240.5)	($15.5)	($26.6)	$166.7	10,249	3,367
138	$59.7	($142.8)	$9.4	$211.8	$151.3	$161.6	($19.8)	($30.1)	$181.7	15,713	5,102
115	$59.7	$12.5	$0.8	$48.0	$47.9	$58.4	($1.4)	($11.9)	$36.1	4,486	1,344
69	$52.7	$16.4	$0.5	$36.8	$60.0	$64.6	($0.9)	($5.4)	$31.4	6,129	2,147
12	$0.0	$0.0	($0.0)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	29	0
Unclassified	$25.8	$13.8	$3.0	$14.9	$0.0	$0.0	$0.0	$0.0	$14.9	NA	NA
Total	$1,767.2	$135.9	$75.8	$1,707.1	$1,990.3	$2,021.5	($72.6)	($103.8)	$1,603.4	56,299	19,510

Constraint Duration

Table 7-8 lists calendar year 2006 and 2007 constraints that were most frequently in effect and shows changes in congestion-event hours from 2006 to 2007.[11]

Constraints 1, 5, 7, 12, 20 and 23 are among the primary operating interfaces. For this group, the number of Day-Ahead Energy Market, congestion-event hours increased from 10,523 to 11,383 hours between 2006 and 2007. The number of Real-Time Energy Market, congestion-event hours for the primary interfaces decreased from 4,164 to 3,964 hours between 2006 and 2007. The AP Control Zone facilities, items number 1, 5, 7 and 20, were constrained 9,690 hours in the Day-Ahead Market in 2007, compared to 8,843 hours in 2006. In the Real-Time Market, these AP Control Zone facilities were constrained for 3,601 hours in 2007 and 3,821 hours in 2006. The PJM Mid-Atlantic Region facilities, items number 12 and 23, were constrained 1,693 hours in the Day-Ahead Market in 2007 compared to 1,680 hours in 2006. In the Real-Time Market, these PJM Mid-Atlantic facilities were constrained 363 hours in 2007 and 343 hours in 2006.

11 Presented in order of descending sum of 2007 day-ahead and real-time, congestion-event hours.

Table 7-8 Top 25 constraints with frequent occurrence: Calendar years 2006 to 2007

			Event Hours						Percent of Annual Hours					
			Day Ahead			Real Time			Day Ahead			Real Time		
No.	Constraint	Type	2006	2007	Change	2006	2007	Change	2006	2007	Change	2006	2007	Change
1	Bedington - Black Oak	Interface	3,875	5,493	1,618	1,812	1,836	24	44%	63%	18%	21%	21%	0%
2	Cloverdale - Lexington	Line	1,517	3,704	2,187	961	1,885	924	17%	42%	25%	11%	22%	11%
3	Pinehill - Stratford	Line	0	3,274	3,274	0	0	0	0%	37%	37%	0%	0%	0%
4	Branchburg - Readington	Line	704	2,324	1,620	480	721	241	8%	27%	18%	5%	8%	3%
5	Kammer	Transformer	2,043	2,005	(38)	688	947	259	23%	23%	(0%)	8%	11%	3%
6	Elrama - Mitchell	Line	654	1,883	1,229	258	784	526	7%	21%	14%	3%	9%	6%
7	Wylie Ridge	Transformer	2,286	1,486	(800)	1,084	685	(399)	26%	17%	(9%)	12%	8%	(5%)
8	5004/5005 Interface	Interface	1,738	1,512	(226)	341	386	45	20%	17%	(3%)	4%	4%	1%
9	State Line - Wolf Lake	Flowgate	943	1,241	298	423	590	167	11%	14%	3%	5%	7%	2%
10	Cedar Grove - Roseland	Line	3,692	1,677	(2,015)	541	133	(408)	42%	19%	(23%)	6%	2%	(5%)
11	East Towanda	Transformer	144	1,055	911	2	410	408	2%	12%	10%	0%	5%	5%
12	Central	Interface	699	1,334	635	15	25	10	8%	15%	7%	0%	0%	0%
13	Bedington	Transformer	662	928	266	451	429	(22)	8%	11%	3%	5%	5%	(0%)
14	Gardners - Hunterstown	Line	496	953	457	257	271	14	6%	11%	5%	3%	3%	0%
15	Beckett - Paulsboro	Line	169	768	599	50	417	367	2%	9%	7%	1%	5%	4%
16	Meadow Brook	Transformer	726	868	142	124	233	109	8%	10%	2%	1%	3%	1%
17	Bedington - Nipetown	Line	185	841	656	8	175	167	2%	10%	7%	0%	2%	2%
18	Mahans Lane - Tidd	Line	382	727	345	118	210	92	4%	8%	4%	1%	2%	1%
19	Calumet - River E.C.	Line	913	842	(71)	0	0	0	10%	10%	(1%)	0%	0%	0%
20	AP South	Interface	639	706	67	237	133	(104)	7%	8%	1%	3%	2%	(1%)
21	Atlantic - Larrabee	Line	0	680	680	0	134	134	0%	8%	8%	0%	2%	2%
22	Brunswick - Edison	Line	464	667	203	206	125	(81)	5%	8%	2%	2%	1%	(1%)
23	West	Interface	981	359	(622)	328	338	10	11%	4%	(7%)	4%	4%	0%
24	Branchburg - Flagtown	Line	188	580	392	123	104	(19)	2%	7%	4%	1%	1%	(0%)
25	Mitchell - Shepler Hill	Line	677	523	(154)	307	160	(147)	8%	6%	(2%)	4%	2%	(2%)

Constraint Costs

Table 7-9 and Table 7-10 present the top constraints affecting congestion costs by facility for calendar years 2006 and 2007.[12] The Bedington — Black Oak Interface was the largest contributor to congestion costs in both 2007 and 2006. With $714 million in total congestion costs, it accounted for 39 percent of the total PJM congestion costs in 2007. The top four constraints in terms of congestion costs together comprised 63 percent of the total PJM congestion costs in 2007.

12 Presented in descending order of annual total congestion costs.

Table 7-9 Top 25 constraints affecting annual PJM congestion costs (By facility): Calendar year 2007

				Congestion Costs (Millions)									Percent of Total PJM Congestion Costs
				Day Ahead				Balancing					
No.	Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	2007
1	Bedington - Black Oak	Interface	500	$466.3	($227.9)	$43.4	$737.6	$523.6	$531.0	($16.2)	($23.5)	$714.0	39%
2	Cloverdale - Lexington	Line	AEP	$132.0	($69.2)	$22.4	$223.6	$203.5	$177.5	($22.5)	$3.5	$227.1	12%
3	5004/5005 Interface	Interface	500	$3.4	($111.9)	$5.7	$121.0	($33.9)	($29.6)	($0.3)	($4.6)	$116.5	6%
4	AP South	Interface	500	$36.9	($57.1)	$4.3	$98.4	$12.5	$10.4	$1.0	$3.1	$101.5	6%
5	Kammer	Transformer	500	$31.3	($16.3)	$11.6	$59.2	($39.8)	($48.6)	($3.7)	$5.1	$64.3	3%
6	Branchburg - Readington	Line	PSEG	($505.9)	($597.3)	$9.4	$100.8	($358.0)	($328.7)	($8.4)	($37.6)	$63.1	3%
7	Bedington	Transformer	AP	($16.9)	($77.1)	$2.9	$63.1	($2.9)	($1.4)	($2.0)	($3.4)	$59.7	3%
8	Meadow Brook	Transformer	AP	($3.4)	($47.5)	$0.7	$44.9	$3.2	$2.8	($0.4)	$0.0	$44.9	2%
9	Central	Interface	500	($43.7)	($73.5)	$2.5	$32.4	($2.0)	($2.1)	$0.0	$0.0	$32.4	2%
10	Atlantic - Larrabee	Line	JCPL	$15.2	($13.5)	$1.7	$30.3	$1.2	$7.6	($0.8)	($7.2)	$23.1	1%
11	Branchburg - Flagtown	Line	PSEG	($0.3)	($21.4)	$0.4	$21.5	$4.2	$4.8	($1.3)	($2.0)	$19.5	1%
12	Wylie Ridge	Transformer	AP	$27.4	$6.2	$10.1	$31.3	($30.7)	($27.9)	($9.6)	($12.4)	$18.9	1%
13	Brunner Island - Yorkana	Line	Met-Ed	($0.4)	($15.1)	$0.1	$14.9	$50.3	$46.7	$0.1	$3.7	$18.6	1%
14	East	Interface	500	($25.2)	($41.9)	$0.8	$17.5	($0.4)	($0.4)	($0.0)	($0.0)	$17.4	1%
15	Amos	Transformer	AEP	$1.9	($16.5)	$0.5	$18.9	$14.6	$13.2	($3.4)	($2.0)	$17.0	1%
16	Conastone	Transformer	BGE	($2.9)	($16.3)	$0.4	$13.8	$15.0	$13.7	($0.3)	$1.0	$14.8	1%
17	Kanawha - Matt Funk	Line	AEP	($10.6)	($24.3)	$1.8	$15.5	$3.9	$4.4	($0.3)	($0.8)	$14.7	1%
18	Doubs	Transformer	AP	$5.8	($9.0)	$0.5	$15.3	($0.9)	($1.1)	($0.7)	($0.5)	$14.7	1%
19	Beckett - Paulsboro	Line	AECO	$1.6	($14.6)	$0.1	$16.3	$4.5	$6.5	($0.0)	($2.1)	$14.2	1%
20	Bedington - Nipetown	Line	AP	$12.5	($1.9)	$0.6	$15.0	$10.6	$10.9	($0.8)	($1.1)	$13.9	1%
21	Cloverdale	Transformer	AEP	$0.1	($13.0)	$1.5	$14.5	$2.6	$2.9	($0.7)	($1.0)	$13.5	1%
22	Darwin - Eugene	Line	AEP	($0.2)	($3.5)	$0.1	$3.3	$0.1	$6.1	($9.9)	($16.0)	($12.6)	(1%)
23	Unclassified	Unclassified	Unclassified	$12.2	$1.1	$1.3	$12.4	$0.0	$0.0	$0.0	$0.0	$12.4	1%
24	West	Interface	500	$4.1	($13.3)	$2.0	$19.4	($27.0)	($22.3)	($3.6)	($8.4)	$11.0	1%
25	Axton	Transformer	AEP	($4.8)	($14.1)	$1.1	$10.5	$0.0	$0.0	$0.0	$0.0	$10.5	1%

Table 7-10 Top 25 constraints affecting annual PJM congestion costs (By facility): Calendar year 2006

				Congestion Costs (Millions)									Percent of Total PJM Congestion Costs
				Day Ahead				Balancing					
No.	Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	2006
1	Bedington - Black Oak	Interface	500	$1,442.4	$971.9	$15.6	$486.1	$1,113.7	$1,104.9	($3.3)	$5.5	$491.6	31%
2	5004/5005 Interface	Interface	500	($10.7)	($115.5)	$0.6	$105.4	$11.4	$10.4	($0.4)	$0.6	$106.0	7%
3	Mount Storm - Pruntytown	Line	AP	$345.2	$249.4	$4.5	$100.3	$227.2	$228.2	($0.9)	($1.9)	$98.4	6%
4	Kanawha - Matt Funk	Line	AEP	$207.3	$108.2	$2.7	$101.9	$168.7	$181.1	($5.1)	($17.5)	$84.4	5%
5	AP South	Interface	500	$129.8	$55.5	$1.9	$76.2	$184.2	$178.0	($1.6)	$4.6	$80.8	5%
6	Cloverdale - Lexington	Line	AEP	$95.4	$34.0	$3.4	$64.8	$229.1	$224.0	($7.0)	($1.9)	$63.0	4%
7	West	Interface	500	($0.1)	($54.3)	$1.2	$55.5	($3.8)	($5.6)	($0.9)	$0.9	$56.4	4%
8	Meadow Brook	Transformer	AP	($19.3)	($75.1)	($0.9)	$54.9	$4.2	$4.0	$0.2	$0.4	$55.2	3%
9	Kammer	Transformer	500	$79.1	$41.4	$3.9	$41.7	$40.1	$33.5	($0.8)	$5.7	$47.4	3%
10	Bedington	Transformer	AP	$32.6	($12.2)	$0.9	$45.7	$88.8	$90.6	($0.9)	($2.7)	$42.9	3%
11	Doubs - Mount Storm	Line	500	$66.1	$28.6	$0.5	$38.0	$31.3	$30.0	($0.8)	$0.5	$38.5	2%
12	Doubs	Transformer	AP	($2.8)	($35.4)	($0.1)	$32.5	$20.5	$20.0	($0.1)	$0.3	$32.8	2%
13	Axton	Transformer	AEP	$63.7	$41.7	$1.8	$23.8	$9.2	$9.7	($0.1)	($0.7)	$23.1	1%
14	Whitpain	Transformer	PECO	$8.0	($12.9)	$0.6	$21.5	($9.7)	($8.1)	($0.8)	($2.4)	$19.1	1%
15	Aqueduct - Doubs	Line	AP	$77.8	$60.1	$0.6	$18.4	$50.1	$49.4	($0.6)	$0.1	$18.5	1%
16	Laurel - Woodstown	Line	AECO	$32.4	$11.8	$0.2	$20.8	$39.2	$42.4	($0.5)	($3.7)	$17.2	1%
17	Cedar Grove - Roseland	Line	PSEG	($750.7)	($770.5)	$1.8	$21.6	($184.5)	($178.8)	$0.3	($5.4)	$16.2	1%
18	Central	Interface	500	($72.1)	($87.4)	$0.6	$15.8	($1.7)	($1.6)	($0.0)	($0.1)	$15.7	1%
19	Unclassified	Unclassified	Unclassified	$25.8	$13.8	$3.0	$14.9	$0.0	$0.0	$0.0	$0.0	$14.9	1%
20	East	Interface	500	($29.6)	($42.3)	$0.2	$12.9	($1.1)	($1.3)	$0.0	$0.2	$13.1	1%
21	Wylie Ridge	Transformer	AP	$46.0	$25.3	$6.8	$27.4	$18.0	$25.6	($6.7)	($14.3)	$13.1	1%
22	Axton - Jacksons Ferry	Line	AEP	$29.2	$17.7	$1.2	$12.7	$1.7	$1.8	($0.0)	($0.2)	$12.5	1%
23	Dooms	Transformer	Dominion	$23.0	$11.2	$0.7	$12.4	$58.4	$56.7	($2.3)	($0.6)	$11.8	1%
24	Cloverdale	Transformer	AEP	$19.5	$8.2	$0.5	$11.8	$10.4	$10.5	($0.3)	($0.3)	$11.5	1%
25	Hunterstown	Transformer	Met-Ed	$30.9	$21.0	($0.1)	$9.8	$1.4	$1.6	$0.0	($0.2)	$9.5	1%

Congestion-Event Summary for Midwest ISO Flowgates

PJM and the Midwest ISO have a joint operating agreement (JOA) which defines a coordinated methodology for congestion management. This agreement establishes reciprocal, coordinated flowgates in the combined footprint whose operating limits are respected by the operators of both organizations.[13] A flowgate is a representative modeling of facilities or groups of facilities that may act as potential constraint points on the regional system.[14] PJM models these coordinated flowgates and controls for them in its security-constrained, economic dispatch. Table 7-11 and Table 7-12 show the Midwest ISO flowgates which PJM took dispatch action to control during 2007 and 2006, respectively, 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 affecting PJM dispatch are presented by constraint, in descending order of the absolute value of total congestion costs. Among Midwest ISO flowgates in 2007, the Crete — St. Johns Tap constraint made the most significant contribution to positive congestion while the State Line — Wolf Lake line made the most significant contribution to negative congestion. Among Midwest ISO flowgates in 2006, the Pierce and Rising flowgates made the most significant contributions to positive congestion, while the State Line — Wolf Lake flowgate made the most significant negative contribution.

Table 7-11 Top congestion cost impacts from Midwest ISO flowgates affecting PJM dispatch (By facility): Calendar year 2007

			Congestion Costs (Millions)										
			Day Ahead				Balancing					Event Hours	
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
State Line - Wolf Lake	Flowgate	Midwest ISO	($9.6)	($13.1)	$3.9	$7.3	($12.9)	($12.2)	($8.7)	($9.5)	($2.2)	1,241	590
Lanesville	Flowgate	Midwest ISO	$1.7	$1.0	($0.0)	$0.7	$0.3	$0.6	($2.1)	($2.4)	($1.7)	48	50
Pana North	Flowgate	Midwest ISO	$0.0	($0.0)	$0.0	$0.1	($0.4)	($0.4)	($1.8)	($1.8)	($1.7)	20	152
Salem	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	$0.0	($0.2)	$0.1	($0.1)	($0.4)	($0.4)	0	19
Crete - St Johns Tap	Flowgate	Midwest ISO	($0.2)	($0.4)	$0.1	$0.3	($0.0)	($0.0)	($0.1)	($0.1)	$0.3	20	4
Tower Road	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	$0.0	($0.0)	($0.1)	$0.2	$0.2	$0.2	0	11
Dunes Acres - Michigan City	Flowgate	Midwest ISO	($2.3)	($2.4)	$0.4	$0.5	($4.3)	($5.3)	($1.7)	($0.7)	($0.2)	150	96
Coffeen - Pana North	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	$0.0	($0.0)	$0.1	$0.3	$0.2	$0.2	0	6
Seneca - Krendale	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	$0.0	($1.5)	($1.4)	($0.1)	($0.2)	($0.2)	0	16
Queenston Flow West	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	$0.0	($0.2)	($0.1)	($0.1)	($0.1)	($0.1)	0	16
NE Ohio	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	$0.0	($0.3)	($0.0)	$0.1	($0.1)	($0.1)	0	8
Breed - West Casey	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	($0.1)	($0.1)	($0.1)	0	2
Rising	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	$0.0	($0.2)	($0.2)	($0.1)	($0.0)	($0.0)	0	6
Eau Claire - Arpin	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	$0.0	$0.1	$0.1	($0.0)	($0.0)	($0.0)	0	35
Pierce	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	$0.0	($0.0)	($0.1)	($0.0)	$0.0	$0.0	0	43

13 See "Joint Operating Agreement Between the Midwest Independent Transmission System Operator, Inc. And PJM Interconnection, L.L.C." (February 5, 2008) (Accessed February 5, 2008)< http://www.pjm.com/documents/downloads/agreements/joa-complete.pdf> (1,034 KB).

14 See "Joint Operating Agreement Between the Midwest Independent Transmission System Operator, Inc. And PJM Interconnection, L.L.C." (February 5, 2008) (Accessed February 5, 2008), Section 2.2.18 < http://www.pjm.com/documents/downloads/agreements/joa-complete.pdf> (1,034 KB).

Table 7-12 Top congestion cost impacts from Midwest ISO flowgates affecting PJM dispatch (By facility): Calendar year 2006

			Congestion Costs (Millions)										
			Day Ahead				Balancing					Event Hours	
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
State Line - Wolf Lake	Flowgate	Midwest ISO	($12.7)	($14.2)	$1.7	$3.2	($12.8)	($12.8)	($7.6)	($7.6)	($4.4)	943	423
Lanesville	Flowgate	Midwest ISO	$1.3	$0.8	$0.1	$0.6	($0.1)	$1.6	($0.7)	($2.4)	($1.8)	43	99
Pierce	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	$0.0	($0.0)	($0.2)	$0.3	$0.5	$0.5	0	21
New London - Webster	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	$0.0	($2.5)	($2.4)	($0.3)	($0.4)	($0.4)	0	27
Rising	Flowgate	Midwest ISO	($1.6)	($1.9)	$0.0	$0.3	($0.2)	($0.3)	($0.1)	$0.0	$0.3	111	59
Dunes Acres - Michigan City	Flowgate	Midwest ISO	($1.3)	($1.4)	$0.1	$0.3	($2.6)	($3.2)	($1.2)	($0.6)	($0.3)	51	81
Breed - West Casey	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	$0.0	$0.3	$0.3	($0.1)	($0.1)	($0.1)	0	9
Crete - St Johns Tap	Flowgate	Midwest ISO	($0.3)	($0.4)	$0.0	$0.1	($0.0)	($0.0)	($0.0)	$0.0	$0.1	7	5
Bain - Kenosha	Flowgate	Midwest ISO	$0.2	$0.1	$0.0	$0.1	($0.0)	$0.0	$0.0	($0.0)	$0.1	92	26
Pana North	Flowgate	Midwest ISO	($0.8)	($1.4)	($0.0)	$0.6	($0.3)	($0.0)	($0.3)	($0.5)	$0.1	103	79
State Line - Roxana	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	$0.0	($0.3)	($0.3)	($0.0)	($0.0)	($0.0)	0	6
Powerton - Tazewell	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	$0.0	($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)	($0.0)	($0.0)	($0.0)	($0.0)	0	1
Gillespie Tap - Laclede Tap	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	$0.0	$0.1	$0.1	$0.0	($0.0)	($0.0)	0	5
Eau Claire - Arpin	Flowgate	Midwest ISO	$0.0	$0.0	$0.0	$0.0	$0.0	($0.0)	($0.0)	$0.0	$0.0	0	6

Congestion-Event Summary for the 500 kV System

Constraints on the 500 kV system generally have a regional impact. Table 7-13 and Table 7-14 show the 500 kV constraints impacting 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 impacting congestion costs in PJM are presented by constraint, in descending order of the absolute value of total congestion costs. In 2007, the Bedington — Black Oak and 5004/5005 interface constraints contributed to positive congestion while the Conemaugh — Hunterstown line contributed to negative congestion. In 2006, the Bedington — Black Oak and 5004/5005 interface constraints contributed to positive congestion. In 2006, no 500 kV zone facilities contributed significantly to negative congestion.

Table 7-13 Regional constraints summary (By facility): Calendar year 2007

			Congestion Costs (Millions)										
			Day Ahead				Balancing					Event Hours	
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$466.3	($227.9)	$43.4	$737.6	$523.6	$531.0	($16.2)	($23.5)	$714.0	5,493	1,836
5004/5005 Interface	Interface	500	$3.4	($111.9)	$5.7	$121.0	($33.9)	($29.6)	($0.3)	($4.6)	$116.5	1,512	386
AP South	Interface	500	$36.9	($57.1)	$4.3	$98.4	$12.5	$10.4	$1.0	$3.1	$101.5	706	133
Kammer	Transformer	500	$31.3	($16.3)	$11.6	$59.2	($39.8)	($48.6)	($3.7)	$5.1	$64.3	2,005	947
Central	Interface	500	($43.7)	($73.5)	$2.5	$32.4	($2.0)	($2.1)	$0.0	$0.0	$32.4	1,334	25
East	Interface	500	($25.2)	($41.9)	$0.8	$17.5	($0.4)	($0.4)	($0.0)	($0.0)	$17.4	304	5
West	Interface	500	$4.1	($13.3)	$2.0	$19.4	($27.0)	($22.3)	($3.6)	($8.4)	$11.0	359	338
Conemaugh - Hunterstown	Line	500	$0.0	$0.0	$0.0	$0.0	($1.5)	($0.9)	($0.0)	($0.7)	($0.7)	0	9
MAAC - Scarcity	Interface	500	$0.0	$0.0	$0.0	$0.0	($5.5)	($4.3)	$1.0	($0.1)	($0.1)	0	3
Alburtis - Branchburg	Line	500	$0.0	$0.0	$0.0	$0.0	($0.1)	($0.1)	$0.0	$0.1	$0.1	0	4
Doubs - Mount Storm	Line	500	$0.0	$0.0	$0.0	$0.0	($0.1)	($0.1)	($0.0)	($0.1)	($0.1)	0	4
Harrison - Pruntytown	Line	500	$0.0	$0.0	$0.0	$0.0	($0.1)	($0.1)	($0.0)	$0.0	$0.0	0	3
Harrison Tap - Kammer	Line	500	$0.0	$0.0	$0.0	$0.0	($0.0)	($0.0)	($0.0)	($0.0)	($0.0)	0	2

Table 7-14 Regional constraints summary (By facility): Calendar year 2006

			Congestion Costs (Millions)										
			Day Ahead				Balancing					Event Hours	
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$1,442.4	$971.9	$15.6	$486.1	$1,113.7	$1,104.9	($3.3)	$5.5	$491.6	3,875	1,812
5004/5005 Interface	Interface	500	($10.7)	($115.5)	$0.6	$105.4	$11.4	$10.4	($0.4)	$0.6	$106.0	1,738	341
AP South	Interface	500	$129.8	$55.5	$1.9	$76.2	$184.2	$178.0	($1.6)	$4.6	$80.8	639	237
West	Interface	500	($0.1)	($54.3)	$1.2	$55.5	($3.8)	($5.6)	($0.9)	$0.9	$56.4	981	328
Kammer	Transformer	500	$79.1	$41.4	$3.9	$41.7	$40.1	$33.5	($0.8)	$5.7	$47.4	2,043	688
Doubs - Mount Storm	Line	500	$66.1	$28.6	$0.5	$38.0	$31.3	$30.0	($0.8)	$0.5	$38.5	240	50
Central	Interface	500	($72.1)	($87.4)	$0.6	$15.8	($1.7)	($1.6)	($0.0)	($0.1)	$15.7	699	15
East	Interface	500	($29.6)	($42.3)	$0.2	$12.9	($1.1)	($1.3)	$0.0	$0.2	$13.1	324	11
Fort Martin - Pruntytown	Line	500	$14.1	$8.5	$0.3	$5.9	$4.1	$4.0	($0.1)	($0.0)	$5.9	111	22
Harrison Tap - Kammer	Line	500	$0.8	$0.3	$0.1	$0.6	$5.2	$4.7	($0.3)	$0.2	$0.7	51	52
Elroy - Hosensack	Line	500	$0.0	$0.0	$0.0	$0.0	$0.4	$0.3	($0.0)	$0.0	$0.0	0	4
Harrison - Harrison Tap	Line	500	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	($0.0)	$0.0	$0.0	0	3

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 2007. In 2007, congestion costs associated with the Bedington — Black Oak and AP South interface constraints were $714 million and $101.5 million, respectively. In 2007, the Bedington — Black Oak and AP South interfaces were constrained 5,493 hours and 706 hours day ahead, respectively. The Bedington — Black Oak and AP South interfaces were constrained 1,836 hours and 133 hours in real time in 2007, respectively. In 2006, congestion costs associated with Bedington — Black Oak and AP South were $491.6 million and $80.8 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. These results are summarized in Table 7-13 and Table 7-14.

Zonal Congestion

Summary

Day-ahead and balancing congestion costs within specific zones for calendar years 2007 and 2006 are presented in Table 7-15 and Table 7-16. The AP Control Zone, with $448.6 million, incurred the most congestion charges of any control zone in 2007. The leading contributors to congestion in the AP Control Zone in 2007 were the Bedington — Black Oak Interface and the Cloverdale — Lexington line constraints. These two facilities contributed $240.2 and $46.7 million in positive congestion costs, respectively, and together constituted 64 percent of all congestion charges in the AP Control Zone. The Dominion Control Zone incurred the second highest amount of congestion charges in 2007, also driven by congestion on the Bedington — Black Oak Interface and the Cloverdale — Lexington line constraints. These two facilities constituted $99 and $86.4 million in congestion charges, respectively, or 64 percent of the Dominion Control Zone total.

Table 7-15 Congestion cost summary (By control zone): Calendar year 2007

Congestion Costs (Millions)									
	Day Ahead				Balancing				
Control Zone	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total
AECO	$81.2	$35.6	$0.3	$45.8	$92.3	$90.5	($0.4)	$1.3	$47.1
AEP	($1,369.5)	($1,659.2)	$12.8	$302.6	($1,340.9)	($1,225.8)	($2.0)	($117.1)	$185.5
AP	$72.4	($388.5)	$43.1	$503.9	$14.1	$54.4	($15.0)	($55.3)	$448.6
BGE	$407.4	$358.6	$8.9	$57.7	$498.6	$460.4	($12.5)	$25.8	$83.4
ComEd	($1,569.5)	($1,673.2)	($1.1)	$102.6	($941.7)	($1,019.7)	$0.3	$78.3	$180.9
DAY	($181.0)	($198.8)	($0.1)	$17.8	($185.2)	($178.7)	($0.0)	($6.6)	$11.2
DLCO	($321.6)	($406.9)	($0.0)	$85.2	($200.6)	($158.4)	$0.0	($42.2)	$43.0
Dominion	$920.8	$644.9	$30.8	$306.7	$1,117.0	$1,111.3	($21.6)	($15.9)	$290.8
DPL	$126.4	$61.1	$1.3	$66.6	$134.3	$129.2	($2.2)	$2.9	$69.5
External	($76.3)	($24.3)	$11.0	($40.9)	($11.7)	($31.8)	($74.9)	($54.8)	($95.7)
JCPL	$233.0	$79.0	$4.0	$158.0	$206.9	$198.0	($4.0)	$4.9	$162.9
Met-Ed	$123.5	$92.7	$5.1	$35.9	($0.7)	$10.3	$17.3	$6.3	$42.2
PECO	$451.2	$479.0	$0.7	($27.2)	$15.5	$41.7	($0.9)	($27.0)	($54.2)
PENELEC	($177.6)	($342.7)	$4.5	$169.5	($7.5)	$11.8	($1.3)	($20.6)	$148.9
Pepco	$773.2	$634.7	$13.5	$152.0	$678.8	$622.5	($18.6)	$37.7	$189.6
PPL	$400.1	$410.6	$7.9	($2.6)	$27.6	$32.0	$1.8	($2.6)	($5.3)
PSEG	$371.0	$261.2	$21.1	$130.9	$376.4	$396.3	($24.9)	($44.9)	$86.0
RECO	$10.3	$0.5	$0.5	$10.3	$10.8	$10.5	($0.6)	($0.3)	$9.9
Total	$274.9	($1,635.5)	$164.2	$2,074.6	$484.0	$554.6	($159.5)	($230.1)	$1,844.5

Table 7-16 Congestion cost summary (By control zone): Calendar year 2006

	Congestion Costs (Millions)								
	Day Ahead				Balancing				
Control Zone	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total
AECO	$117.6	$56.5	$0.9	$62.0	$132.1	$126.1	($0.8)	$5.3	$67.2
AEP	($900.0)	($1,176.8)	$25.3	$302.1	($739.2)	($686.2)	($7.4)	($60.4)	$241.7
AP	$90.3	($294.9)	($5.8)	$379.4	$11.3	$48.0	($2.6)	($39.3)	$340.1
BGE	$411.0	$348.4	$1.7	$64.3	$459.2	$416.2	($2.3)	$40.7	$105.0
ComEd	($1,243.8)	($1,298.0)	$33.4	$87.6	($150.8)	($213.2)	($1.0)	$61.3	$149.0
DAY	($131.9)	($148.6)	$5.0	$21.8	($119.3)	($111.2)	($0.0)	($8.1)	$13.6
DLCO	($216.7)	($258.3)	$8.6	$50.2	($137.5)	($115.6)	$0.1	($21.8)	$28.4
Dominion	$977.7	$733.4	$15.1	$259.4	$1,084.7	$1,101.0	($18.4)	($34.7)	$224.7
DPL	$152.6	$80.5	$0.6	$72.7	$149.6	$134.2	($0.9)	$14.5	$87.3
External	($37.2)	($39.3)	($38.1)	($36.0)	$7.0	$10.2	($14.4)	($17.6)	($53.7)
JCPL	$177.5	$84.3	$1.5	$94.8	$144.7	$141.8	($1.8)	$1.1	$95.9
Met-Ed	$141.6	$114.3	$0.0	$27.3	($8.5)	$3.2	($1.5)	($13.2)	$14.2
PECO	$614.1	$641.1	$0.3	($26.7)	$13.9	$41.0	($0.5)	($27.6)	($54.3)
PENELEC	($142.7)	($257.7)	($1.2)	$113.7	($12.3)	($4.0)	($2.0)	($10.3)	$103.4
Pepco	$881.5	$728.4	$2.3	$155.3	$682.3	$652.9	($3.7)	$25.7	$181.0
PPL	$457.5	$486.6	($2.6)	($31.7)	$26.8	$32.9	$0.1	($6.0)	($37.7)
PSEG	$406.8	$335.3	$27.8	$99.4	$434.1	$433.7	($14.2)	($13.9)	$85.6
RECO	$11.4	$0.7	$0.8	$11.5	$12.2	$10.5	($1.3)	$0.5	$12.0
Total	$1,767.2	$135.9	$75.8	$1,707.1	$1,990.3	$2,021.5	($72.6)	($103.8)	$1,603.4

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: the PJM Mid-Atlantic Region with 11 control zones (the AECO, BGE, DPL, JCPL, Met-Ed, PECO, PENELEC, Pepco, PPL, PSEG and RECO control zones); 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 7-17 through Table 7-50 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 2006 and 2007. For each of these constraints, the zonal cost impacts are decomposed into their Day-Ahead Energy Market 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 congestion costs. Both day-ahead and real-time, 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 7-17 and Table 7-18 show the constraints with the largest impacts on total congestion cost in the AECO Control Zone. In 2007, the Beckett — Paulsboro and Bedington — Black Oak constraints were the largest contributors to positive congestion while the Branchburg — Readington and Atlantic — Larrabee lines contributed to negative congestion. All of these constraints are located outside of the AECO Control Zone except for Beckett — Paulsboro. In 2006, the Laurel — Woodstown and Bedington — Black Oak constraints had been the largest contributors to positive congestion while the Cedar Grove — Roseland and Branchburg — Readington constraints contributed to negative congestion.

Table 7-17 AECO Control Zone top congestion cost impacts (By facility): Calendar year 2007

			Congestion Costs (Millions)									Event Hours	
			Day Ahead				Balancing						
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Beckett - Paulsboro	Line	AECO	$22.3	$6.5	$0.1	$15.9	$21.1	$23.3	($0.0)	($2.2)	$13.7	768	417
Bedington - Black Oak	Interface	500	$18.7	$11.0	$0.0	$7.8	$18.1	$16.5	($0.0)	$1.6	$9.4	5,493	1,836
Branchburg - Readington	Line	PSEG	($9.8)	($6.0)	($0.0)	($3.9)	($15.8)	($14.0)	$0.1	($1.7)	($5.6)	2,324	721
5004/5005 Interface	Interface	500	$11.3	$6.5	$0.1	$4.9	$7.2	$6.8	($0.0)	$0.4	$5.3	1,512	386
Cloverdale - Lexington	Line	AEP	$9.2	$5.6	$0.0	$3.6	$14.3	$12.8	($0.0)	$1.4	$5.0	3,704	1,885
Kammer	Transformer	500	$6.6	$3.9	$0.0	$2.8	$9.7	$8.9	($0.0)	$0.7	$3.5	2,005	947
Central	Interface	500	$6.6	$3.9	$0.0	$2.7	$0.3	$0.3	($0.0)	$0.0	$2.7	1,334	25
Wylie Ridge	Transformer	AP	$4.6	$2.6	$0.1	$2.1	$6.8	$6.1	($0.2)	$0.5	$2.6	1,486	685
Churchtown	Transformer	AECO	($0.7)	($3.4)	($0.2)	$2.6	$0.3	$0.6	$0.2	($0.1)	$2.5	328	194
Atlantic - Larrabee	Line	JCPL	($2.9)	($1.4)	($0.0)	($1.5)	($5.4)	($4.8)	$0.0	($0.5)	($2.0)	680	134
AP South	Interface	500	$3.1	$1.6	$0.0	$1.5	$2.4	$2.2	($0.1)	$0.2	$1.7	706	133
West	Interface	500	$1.9	$1.1	$0.0	$0.8	$6.7	$6.3	($0.0)	$0.4	$1.2	359	338
East	Interface	500	$2.0	$1.1	$0.0	$1.0	$0.1	$0.1	$0.0	$0.0	$1.0	304	5
Cardiff	Transformer	AECO	$0.4	$0.1	$0.0	$0.4	$4.6	$4.1	($0.0)	$0.5	$0.9	26	27
Carlls Corner - Sherman Ave	Line	AECO	$0.4	$0.0	$0.0	$0.4	$0.4	$1.5	($0.0)	($1.2)	($0.8)	182	82

Table 7-18 AECO Control Zone top congestion cost impacts (By facility): Calendar year 2006

			Congestion Costs (Millions)										
			Day Ahead				Balancing					Event Hours	
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Laurel - Woodstown	Line	AECO	$32.3	$11.7	$0.3	$20.9	$43.9	$46.8	($0.5)	($3.3)	$17.5	2,157	1,203
Bedington - Black Oak	Interface	500	$26.1	$15.0	$0.2	$11.3	$30.9	$27.4	($0.1)	$3.4	$14.7	3,875	1,812
5004/5005 Interface	Interface	500	$13.8	$7.8	$0.1	$6.1	$9.3	$8.1	($0.1)	$1.1	$7.1	1,738	341
Cedar Grove - Roseland	Line	PSEG	($9.1)	($5.0)	($0.0)	($4.1)	($6.4)	($5.5)	$0.0	($0.9)	($5.0)	3,692	541
Mount Storm - Pruntytown	Line	AP	$5.9	$3.1	$0.0	$2.8	$5.5	$5.0	$0.0	$0.5	$3.3	891	465
West	Interface	500	$6.5	$4.2	$0.0	$2.3	$6.1	$5.2	($0.0)	$0.9	$3.2	981	328
Kammer	Transformer	500	$5.8	$3.5	$0.0	$2.3	$5.4	$4.7	($0.0)	$0.7	$3.0	2,043	688
Wylie Ridge	Transformer	AP	$4.1	$2.2	$0.0	$1.9	$7.7	$6.6	($0.0)	$1.0	$2.9	2,286	1,084
Branchburg - Readington	Line	PSEG	($3.0)	($1.6)	$0.0	($1.4)	($9.9)	($8.4)	$0.0	($1.4)	($2.8)	704	480
Cloverdale - Lexington	Line	AEP	$3.2	$1.7	$0.0	$1.4	$9.1	$7.9	($0.0)	$1.1	$2.6	1,517	961
Central	Interface	500	$5.1	$2.8	$0.0	$2.3	$0.2	$0.2	($0.0)	$0.0	$2.4	699	15
AP South	Interface	500	$3.5	$2.0	$0.0	$1.5	$7.1	$6.4	($0.0)	$0.7	$2.2	639	237
Kanawha - Matt Funk	Line	AEP	$3.0	$1.8	$0.0	$1.3	$4.1	$3.6	$0.0	$0.5	$1.8	2,025	617
Deepwater	Transformer	AECO	$1.6	($0.0)	$0.0	$1.7	$3.9	$3.7	($0.1)	$0.1	$1.8	66	67
Carlls Corner - Sherman Ave	Line	AECO	$2.7	$0.9	$0.0	$1.8	$2.8	$2.9	($0.0)	($0.1)	$1.7	712	160

BGE Control Zone

Table 7-19 and Table 7-20 show the constraints with the largest impacts on total congestion cost in the BGE Control Zone. In 2007, the Bedington — Black Oak and Conastone transformer constraints were the largest contributors to positive congestion while the Branchburg — Readington constraint contributed to negative congestion. In 2006, the Bedington — Black Oak and Mount Storm — Pruntytown constraints had been the largest contributors to positive congestion while the Cedar Grove — Roseland and Branchburg — Readington constraints contributed to negative congestion.

Table 7-19 BGE Control Zone top congestion cost impacts (By facility): Calendar year 2007

			Congestion Costs (Millions)									Event Hours	
			Day Ahead				Balancing						
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$228.4	$203.7	$4.1	$28.8	$207.1	$190.1	($4.0)	$13.0	$41.8	5,493	1,836
Branchburg - Readington	Line	PSEG	($30.8)	($26.1)	($0.6)	($5.3)	($37.9)	($36.0)	$0.6	($1.3)	($6.6)	2,324	721
Conastone	Transformer	BGE	$12.0	$6.4	($0.1)	$5.6	$15.0	$14.2	$0.0	$0.8	$6.4	172	55
Kammer	Transformer	500	$27.6	$23.2	$1.0	$5.3	$32.6	$30.4	($1.2)	$1.0	$6.3	2,005	947
AP South	Interface	500	$26.7	$22.9	$0.4	$4.2	$18.6	$16.9	($0.2)	$1.4	$5.6	706	133
5004/5005 Interface	Interface	500	$14.9	$10.3	$0.7	$5.4	$6.4	$6.1	($0.3)	($0.0)	$5.4	1,512	386
Cloverdale - Lexington	Line	AEP	$67.9	$71.0	$1.8	($1.3)	$80.0	$72.4	($1.7)	$5.9	$4.6	3,704	1,885
Wylie Ridge	Transformer	AP	$13.9	$11.7	$0.6	$2.8	$15.5	$14.4	($0.8)	$0.4	$3.2	1,486	685
Brunner Island - Yorkana	Line	Met-Ed	$5.8	$4.3	$0.0	$1.5	$16.5	$15.8	($0.2)	$0.6	$2.1	172	196
Bedington	Transformer	AP	$9.7	$8.4	$0.2	$1.6	$9.0	$8.6	($0.2)	$0.2	$1.8	928	429
Aqueduct - Doubs	Line	AP	$5.2	$3.7	$0.0	$1.5	$1.3	$1.2	($0.0)	$0.1	$1.6	262	21
West	Interface	500	$5.5	$4.2	$0.3	$1.7	$16.5	$15.4	($1.4)	($0.3)	$1.4	359	338
Doubs	Transformer	AP	$3.6	$2.3	$0.0	$1.2	$3.8	$3.7	($0.1)	$0.1	$1.3	135	99
Bedington - Nipetown	Line	AP	$3.5	$2.7	$0.1	$0.9	$4.4	$4.1	($0.1)	$0.3	$1.2	841	175
Mount Storm - Pruntytown	Line	AP	$0.6	$0.5	$0.0	$0.0	$12.3	$11.1	($0.1)	$1.1	$1.1	33	151

Table 7-20 BGE Control Zone top congestion cost impacts (By facility): Calendar year 2006

			Congestion Costs (Millions)									Event Hours	
			Day Ahead				Balancing						
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$199.2	$175.5	$0.7	$24.3	$200.4	$178.4	($0.6)	$21.5	$45.7	3,875	1,812
Mount Storm - Pruntytown	Line	AP	$43.6	$39.3	$0.1	$4.4	$33.7	$31.4	($0.0)	$2.4	$6.7	891	465
AP South	Interface	500	$24.1	$20.9	$0.1	$3.3	$40.2	$36.9	($0.1)	$3.1	$6.4	639	237
Aqueduct - Doubs	Line	AP	$17.5	$11.6	$0.1	$5.9	$11.2	$10.7	($0.0)	$0.5	$6.4	362	127
5004/5005 Interface	Interface	500	$13.7	$8.7	$0.1	$5.2	$7.7	$7.4	($0.1)	$0.2	$5.4	1,738	341
Doubs - Mount Storm	Line	500	$15.0	$11.3	$0.0	$3.8	$8.6	$7.3	($0.0)	$1.3	$5.1	240	50
West	Interface	500	$17.7	$14.3	$0.1	$3.5	$13.5	$12.2	($0.2)	$1.1	$4.7	981	328
Kammer	Transformer	500	$23.4	$22.2	$0.1	$1.4	$19.2	$16.1	($0.1)	$3.0	$4.4	2,043	688
Wylie Ridge	Transformer	AP	$12.4	$11.2	$0.1	$1.3	$19.0	$16.5	($0.2)	$2.3	$3.6	2,286	1,084
Cloverdale - Lexington	Line	AEP	$20.2	$21.0	$0.1	($0.7)	$42.9	$38.5	($0.3)	$4.2	$3.4	1,517	961
Doubs	Transformer	AP	$8.2	$5.1	$0.0	$3.1	$5.5	$5.3	($0.0)	$0.2	$3.3	90	74
Cedar Grove - Roseland	Line	PSEG	($29.7)	($27.6)	($0.2)	($2.3)	($15.2)	($14.4)	$0.0	($0.8)	($3.1)	3,692	541
Conastone	Transformer	BGE	$5.3	$2.8	$0.0	$2.5	$8.8	$8.4	($0.0)	$0.3	$2.8	99	27
Branchburg - Readington	Line	PSEG	($10.0)	($9.6)	($0.1)	($0.4)	($22.7)	($20.5)	$0.1	($2.1)	($2.5)	704	480
Kanawha - Matt Funk	Line	AEP	$20.1	$20.8	$0.1	($0.6)	$21.4	$18.1	($0.2)	$3.1	$2.5	2,025	617

DPL Control Zone

Table 7-21 and Table 7-22 show the constraints with the largest impacts on total congestion cost in the DPL Control Zone. In 2007, the Bedington — Black Oak and Cloverdale — Lexington constraints were the largest contributors to positive congestion while the Branchburg — Readington and Atlantic — Larrabee constraints contributed to negative congestion. In 2006, the Bedington — Black Oak and 5004/5005 interface constraints had been the largest contributors to positive congestion while the Cedar Grove — Roseland and Branchburg — Readington constraints contributed to negative congestion.

Table 7-21 DPL Control Zone top congestion cost impacts (By facility): Calendar year 2007

			Congestion Costs (Millions)									Event Hours	
			Day Ahead				Balancing						
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$42.5	$21.7	$0.3	$21.1	$38.2	$35.6	($0.2)	$2.3	$23.4	5,493	1,836
Cloverdale - Lexington	Line	AEP	$19.6	$8.9	$0.2	$10.9	$25.7	$23.3	($0.2)	$2.1	$13.0	3,704	1,885
Branchburg - Readington	Line	PSEG	($20.9)	($10.6)	($0.1)	($10.4)	($28.0)	($26.1)	$0.3	($1.6)	($12.0)	2,324	721
5004/5005 Interface	Interface	500	$21.5	$11.6	$0.2	$10.1	$11.1	$10.9	($0.1)	$0.1	$10.2	1,512	386
Kammer	Transformer	500	$13.1	$6.7	$0.2	$6.6	$17.1	$16.2	($0.2)	$0.7	$7.3	2,005	947
Central	Interface	500	$13.5	$7.1	$0.1	$6.5	$0.5	$0.5	($0.0)	$0.0	$6.5	1,334	25
Wylie Ridge	Transformer	AP	$9.2	$4.6	$0.1	$4.7	$11.6	$10.7	($0.1)	$0.7	$5.4	1,486	685
AP South	Interface	500	$6.6	$3.4	$0.0	$3.2	$4.7	$4.3	($0.0)	$0.3	$3.6	706	133
West	Interface	500	$3.9	$2.0	$0.0	$1.9	$12.2	$11.3	($0.2)	$0.7	$2.7	359	338
East	Interface	500	$4.3	$2.1	$0.0	$2.2	$0.1	$0.1	($0.0)	$0.0	$2.3	304	5
North Seaford	Transformer	DPL	$2.5	$0.6	$0.0	$2.0	$0.5	$0.4	$0.0	$0.0	$2.0	149	7
Atlantic - Larrabee	Line	JCPL	($2.6)	($1.3)	($0.0)	($1.3)	($4.1)	($3.7)	$0.1	($0.3)	($1.6)	680	134
Elrama - Mitchell	Line	AP	$2.4	$1.2	$0.0	$1.2	$4.0	$3.8	($0.0)	$0.2	$1.4	1,883	784
Conastone	Transformer	BGE	($3.3)	($1.9)	($0.0)	($1.5)	($4.7)	($4.8)	$0.0	$0.1	($1.4)	172	55
Cedar Grove - Roseland	Line	PSEG	($2.4)	($1.1)	($0.0)	($1.4)	($0.8)	($0.8)	$0.0	($0.0)	($1.4)	1,677	133

Table 7-22 DPL Control Zone top congestion cost impacts (By facility): Calendar year 2006

			Congestion Costs (Millions)										
			Day Ahead				Balancing					Event Hours	
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$48.4	$26.1	$0.1	$22.4	$56.6	$50.0	($0.1)	$6.5	$28.9	3,875	1,812
5004/5005 Interface	Interface	500	$24.0	$14.1	$0.1	$10.0	$13.0	$12.1	($0.1)	$0.8	$10.8	1,738	341
Cedar Grove - Roseland	Line	PSEG	($15.6)	($7.4)	($0.1)	($8.3)	($9.7)	($8.0)	$0.0	($1.7)	($10.0)	3,692	541
Kammer	Transformer	500	$10.2	$5.2	$0.0	$5.1	$10.5	$8.6	($0.0)	$1.9	$6.9	2,043	688
Wylie Ridge	Transformer	AP	$7.4	$3.7	$0.0	$3.8	$13.3	$10.9	($0.0)	$2.3	$6.1	2,286	1,084
West	Interface	500	$11.3	$6.8	($0.0)	$4.4	$10.7	$9.0	($0.0)	$1.7	$6.1	981	328
Mount Storm - Pruntytown	Line	AP	$10.8	$5.4	$0.0	$5.4	$9.2	$8.6	($0.0)	$0.6	$5.9	891	465
Cloverdale - Lexington	Line	AEP	$6.2	$2.4	$0.0	$3.8	$15.1	$13.1	($0.1)	$1.9	$5.7	1,517	961
Branchburg - Readington	Line	PSEG	($5.5)	($2.7)	$0.0	($2.7)	($16.2)	($13.6)	$0.1	($2.5)	($5.2)	704	480
Central	Interface	500	$9.6	$5.2	$0.1	$4.5	$0.3	$0.3	($0.0)	$0.0	$4.5	699	15
Kanawha - Matt Funk	Line	AEP	$5.5	$2.7	$0.0	$2.8	$7.8	$6.6	($0.0)	$1.1	$3.9	2,025	617
AP South	Interface	500	$6.1	$3.5	$0.0	$2.7	$12.5	$11.2	($0.1)	$1.1	$3.8	639	237
Doubs - Mount Storm	Line	500	$4.4	$2.6	$0.0	$1.8	$2.8	$2.2	($0.0)	$0.5	$2.3	240	50
Mardela - Vienna	Line	DPL	$4.0	$1.6	$0.0	$2.4	$2.7	$3.0	($0.0)	($0.3)	$2.0	236	103
East	Interface	500	$2.8	$1.3	$0.0	$1.5	$0.3	$0.3	$0.0	$0.1	$1.6	324	11

JCPL Control Zone

Table 7-23 and Table 7-24 show the constraints with the largest impacts on total congestion cost in the JCPL Control Zone. In 2007, the Branchburg — Readington and Atlantic — Larrabee constraints were the largest contributors to positive congestion while the Cedar Grove — Roseland constraint contributed to negative congestion. In 2006, the Bedington — Black Oak and 5004/5005 interface constraints had been the largest contributors to positive congestion while the Cedar Grove — Roseland and Branchburg — Readington constraints contributed to negative congestion.

Table 7-23 JCPL Control Zone top congestion cost impacts (By facility): Calendar year 2007

			Congestion Costs (Millions)									Event Hours	
			Day Ahead				Balancing						
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Branchburg - Readington	Line	PSEG	$33.3	$5.6	$1.5	$29.2	$15.8	$13.5	($1.9)	$0.4	$29.6	2,324	721
Atlantic - Larrabee	Line	JCPL	$27.8	$4.9	$0.5	$23.4	$20.7	$21.5	($0.3)	($1.1)	$22.3	680	134
Bedington - Black Oak	Interface	500	$35.8	$15.9	$0.6	$20.6	$24.0	$23.6	($0.5)	($0.0)	$20.6	5,493	1,836
5004/5005 Interface	Interface	500	$32.7	$14.1	$0.4	$19.0	$16.1	$15.1	($0.1)	$0.9	$19.8	1,512	386
Cloverdale - Lexington	Line	AEP	$23.2	$7.8	$0.4	$15.8	$26.4	$25.5	($0.3)	$0.5	$16.3	3,704	1,885
Kammer	Transformer	500	$17.8	$7.5	$0.2	$10.5	$20.0	$19.3	($0.1)	$0.6	$11.1	2,005	947
Central	Interface	500	$17.0	$6.4	$0.1	$10.7	$0.6	$0.6	($0.0)	$0.1	$10.8	1,334	25
Cedar Grove - Roseland	Line	PSEG	($13.9)	($4.3)	($0.8)	($10.4)	($3.8)	($3.7)	$0.3	$0.1	($10.3)	1,677	133
Branchburg - Flagtown	Line	PSEG	$19.4	$9.7	$0.2	$10.0	$19.6	$19.4	($0.4)	($0.1)	$9.8	580	104
Wylie Ridge	Transformer	AP	$12.2	$5.1	$0.1	$7.1	$14.4	$13.8	($0.1)	$0.6	$7.7	1,486	685
AP South	Interface	500	$7.0	$3.4	$0.2	$3.8	$4.0	$3.9	($0.1)	$0.0	$3.8	706	133
Redoak - Sayreville	Line	JCPL	($0.4)	($3.0)	($0.0)	$2.6	($0.4)	($0.0)	$1.4	$1.1	$3.6	139	33
West	Interface	500	$5.0	$2.1	$0.0	$2.9	$13.7	$12.9	($0.1)	$0.7	$3.6	359	338
Unclassified	Unclassified	Unclassified	$3.3	$0.4	$0.0	$2.9	$0.0	$0.0	$0.0	$0.0	$2.9	NA	NA
East	Interface	500	$4.5	$1.8	$0.0	$2.7	$0.1	$0.1	($0.0)	$0.0	$2.7	304	5

Table 7-24 JCPL Control Zone top congestion cost impacts (By facility): Calendar year 2006

			Congestion Costs (Millions)									Event Hours	
			Day Ahead				Balancing						
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$59.2	$28.4	$0.2	$31.0	$51.4	$49.7	($0.1)	$1.5	$32.5	3,875	1,812
Cedar Grove - Roseland	Line	PSEG	($46.7)	($17.2)	($0.4)	($29.9)	($22.9)	($21.8)	$0.2	($0.9)	($30.8)	3,692	541
5004/5005 Interface	Interface	500	$38.0	$19.1	$0.2	$19.2	$19.6	$18.4	($0.0)	$1.1	$20.3	1,738	341
West	Interface	500	$17.6	$7.3	$0.1	$10.4	$11.6	$11.0	($0.1)	$0.6	$11.0	981	328
Kammer	Transformer	500	$16.1	$7.1	$0.3	$9.3	$10.7	$10.2	($0.0)	$0.5	$9.8	2,043	688
Wylie Ridge	Transformer	AP	$12.3	$5.3	$0.1	$7.2	$15.0	$14.2	($0.0)	$0.8	$7.9	2,286	1,084
Mount Storm - Pruntytown	Line	AP	$12.2	$5.4	($0.0)	$6.7	$8.7	$8.7	($0.0)	($0.0)	$6.7	891	465
Central	Interface	500	$12.0	$5.7	($0.0)	$6.2	$0.3	$0.3	($0.0)	$0.0	$6.3	699	15
Cloverdale - Lexington	Line	AEP	$7.3	$1.9	($0.1)	$5.3	$16.5	$15.7	($0.1)	$0.7	$6.1	1,517	961
Kanawha - Matt Funk	Line	AEP	$9.2	$3.8	$0.1	$5.4	$7.8	$7.3	($0.1)	$0.4	$5.8	2,025	617
AP South	Interface	500	$8.5	$4.4	($0.0)	$4.1	$12.5	$11.9	($0.0)	$0.6	$4.7	639	237
Unclassified	Unclassified	Unclassified	$4.7	$0.6	$0.0	$4.2	$0.0	$0.0	$0.0	$0.0	$4.2	NA	NA
Branchburg - Readington	Line	PSEG	($2.6)	($2.1)	$0.7	$0.2	($10.4)	($7.5)	($1.4)	($4.3)	($4.1)	704	480
Doubs - Mount Storm	Line	500	$5.7	$3.2	($0.0)	$2.6	$2.3	$2.5	($0.0)	($0.2)	$2.3	240	50
East	Interface	500	$2.9	$0.9	$0.0	$2.0	$0.3	$0.3	($0.0)	$0.0	$2.0	324	11

Met-Ed Control Zone

Table 7-25 and Table 7-26 show the constraints with the largest impacts on total congestion cost in the Met-Ed Control Zone. In 2007, the Brunner Island — Yorkana and Bedington — Black Oak constraints were the largest contributors to positive congestion while the Branchburg — Readington and Central interface constraints contributed to negative congestion. In 2006, the Hunterstown and Jackson transformer constraints had been the largest contributors to positive congestion while the AP South, Cedar Grove — Roseland and Aqueduct — Doubs constraints contributed to negative congestion.

Table 7-25 Met-Ed Control Zone top congestion cost impacts (By facility): Calendar year 2007

			Congestion Costs (Millions)									Event Hours	
			Day Ahead				Balancing						
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Brunner Island - Yorkana	Line	Met-Ed	$4.2	($3.1)	$0.0	$7.4	$0.1	$0.0	$0.6	$0.6	$8.1	172	196
Bedington - Black Oak	Interface	500	$35.3	$31.8	$1.8	$5.2	($0.4)	$1.5	$4.1	$2.3	$7.5	5,493	1,836
Hunterstown	Transformer	Met-Ed	$8.5	$2.5	$0.3	$6.3	($0.1)	$0.9	$1.0	($0.1)	$6.2	345	139
Jackson	Transformer	Met-Ed	$5.5	$0.1	$0.1	$5.5	($0.2)	$1.6	$1.1	($0.7)	$4.8	155	114
Gardners - Hunterstown	Line	Met-Ed	$2.2	($1.2)	$0.1	$3.4	($0.2)	$0.6	$0.4	($0.4)	$3.0	953	271
5004/5005 Interface	Interface	500	$18.4	$17.1	$0.6	$2.0	($0.1)	$0.6	$1.3	$0.5	$2.5	1,512	386
Kammer	Transformer	500	$11.6	$12.0	$0.9	$0.5	$0.0	$0.2	$1.7	$1.5	$2.0	2,005	947
Bedington	Transformer	AP	$2.0	$0.8	$0.0	$1.3	($0.0)	$0.1	$0.8	$0.6	$1.9	928	429
Branchburg - Readington	Line	PSEG	($13.0)	($10.5)	($0.0)	($2.5)	$0.3	($0.7)	$0.1	$1.0	($1.5)	2,324	721
Conastone	Transformer	BGE	$0.2	($0.8)	$0.0	$1.1	$0.0	$0.2	($0.1)	($0.2)	$0.9	172	55
Cloverdale - Lexington	Line	AEP	$17.3	$15.3	$0.2	$2.1	($0.5)	$1.2	$0.4	($1.3)	$0.8	3,704	1,885
Central	Interface	500	$5.3	$6.2	$0.1	($0.7)	$0.0	$0.0	$0.0	$0.0	($0.7)	1,334	25
AP South	Interface	500	$5.4	$5.6	$0.3	$0.1	$0.1	$0.4	$0.9	$0.6	$0.7	706	133
MAAC - Scarcity	Interface	500	$0.0	$0.0	$0.0	$0.0	($0.0)	($0.0)	$0.6	$0.6	$0.6	0	3
Doubs	Transformer	AP	$0.6	$0.3	$0.1	$0.4	($0.1)	$0.0	$0.2	$0.2	$0.5	135	99

Table 7-26 Met-Ed Control Zone top congestion cost impacts (By facility): Calendar year 2006

			Congestion Costs (Millions)									Event Hours	
			Day Ahead				Balancing						
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Hunterstown	Transformer	Met-Ed	$9.5	$2.7	($0.0)	$6.8	$0.0	$0.3	$0.0	($0.2)	$6.6	303	66
Jackson	Transformer	Met-Ed	$5.0	$0.9	$0.0	$4.1	($0.0)	($0.0)	($0.0)	($0.0)	$4.1	117	54
West	Interface	500	$11.8	$9.8	$0.3	$2.3	($0.2)	($0.1)	($0.2)	($0.2)	$2.0	981	328
5004/5005 Interface	Interface	500	$20.9	$17.1	($1.0)	$2.8	($1.1)	($0.1)	($0.0)	($1.1)	$1.7	1,738	341
Gardners - Hunterstown	Line	Met-Ed	$1.4	($0.3)	($0.0)	$1.7	($0.3)	$0.4	$0.0	($0.7)	$1.0	496	257
AP South	Interface	500	$6.6	$6.2	$0.0	$0.4	($1.4)	($0.1)	($0.1)	($1.4)	($0.9)	639	237
Kammer	Transformer	500	$11.6	$10.1	$0.3	$1.8	($0.5)	$0.1	($0.3)	($0.8)	$0.9	2,043	688
Cedar Grove - Roseland	Line	PSEG	($19.0)	($17.5)	($0.2)	($1.6)	$0.9	$0.2	$0.0	$0.8	($0.9)	3,692	541
Aqueduct - Doubs	Line	AP	$0.8	$1.4	$0.0	($0.6)	($0.2)	($0.0)	($0.1)	($0.2)	($0.9)	362	127
Middletown Jct	Transformer	Met-Ed	$1.1	$0.2	$0.0	$0.9	$0.1	$0.1	($0.0)	($0.0)	$0.9	25	16
Cloverdale - Lexington	Line	AEP	$5.7	$5.2	$0.0	$0.6	($0.6)	$0.5	($0.2)	($1.4)	($0.9)	1,517	961
Mount Storm - Pruntytown	Line	AP	$9.6	$9.3	$0.0	$0.3	($0.9)	$0.2	($0.1)	($1.1)	($0.7)	891	465
Middletown Jct - S Lebanon	Line	Met-Ed	$0.7	$0.0	$0.0	$0.7	$0.0	$0.0	$0.0	$0.0	$0.7	15	0
Doubs - Mount Storm	Line	500	$4.1	$4.2	$0.0	($0.2)	($0.5)	$0.0	($0.0)	($0.5)	($0.7)	240	50
Brunner Island - Yorkana	Line	Met-Ed	$0.1	($0.3)	$0.0	$0.4	$0.3	$0.1	($0.0)	$0.2	$0.6	19	34

PECO Control Zone

Table 7-27 and Table 7-28 show the constraints with the largest impacts on total congestion cost in the PECO Control Zone. In 2007, the Branchburg — Readington and East interface constraints were the largest contributors to positive congestion while the Bedington — Black Oak and Cloverdale — Lexington constraints contributed to negative congestion. In 2006, the Whitpain transformer and Cedar Grove — Roseland constraints had been the largest contributors to positive congestion while the Bedington — Black Oak and 5004/5005 interface constraints contributed to negative congestion.

Table 7-27 PECO Control Zone top congestion cost impacts (By facility): Calendar year 2007

			Congestion Costs (Millions)									Event Hours	
			Day Ahead				Balancing						
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$152.8	$173.9	$0.2	($20.9)	$2.4	$9.4	$0.0	($6.9)	($27.9)	5,493	1,836
Cloverdale - Lexington	Line	AEP	$78.0	$82.0	$0.1	($3.9)	$5.4	$10.2	($0.1)	($5.0)	($8.9)	3,704	1,885
5004/5005 Interface	Interface	500	$89.1	$95.2	$0.1	($6.0)	$1.0	$3.3	($0.0)	($2.4)	($8.3)	1,512	386
Branchburg - Readington	Line	PSEG	($92.6)	($97.2)	($0.0)	$4.6	($0.4)	($3.9)	($0.2)	$3.2	$7.8	2,324	721
Kammer	Transformer	500	$54.0	$57.4	$0.1	($3.3)	$1.4	$5.1	($0.1)	($3.8)	($7.1)	2,005	947
East	Interface	500	$15.2	$10.0	($0.0)	$5.2	($0.0)	($0.0)	$0.0	($0.0)	$5.2	304	5
AP South	Interface	500	$24.7	$28.8	$0.0	($4.1)	$0.1	$1.1	$0.0	($1.0)	($5.0)	706	133
Wylie Ridge	Transformer	AP	$38.1	$40.3	$0.0	($2.2)	$1.4	$3.9	($0.1)	($2.6)	($4.8)	1,486	685
Plymouth Meeting - Whitpain	Line	PECO	$12.4	$7.6	$0.0	$4.8	$0.4	$1.1	$0.0	($0.6)	$4.1	55	34
Central	Interface	500	$51.6	$55.5	$0.1	($3.7)	$0.1	$0.2	($0.0)	($0.1)	($3.8)	1,334	25
West	Interface	500	$16.4	$17.7	$0.0	($1.3)	$0.7	$3.0	($0.0)	($2.3)	($3.6)	359	338
Conastone	Transformer	BGE	($10.1)	($12.9)	($0.0)	$2.8	$0.3	$0.1	$0.0	$0.3	$3.1	172	55
Elrama - Mitchell	Line	AP	$10.1	$11.0	$0.0	($0.9)	$0.9	$1.6	($0.0)	($0.7)	($1.6)	1,883	784
Loudoun - Morrisville	Line	Dominion	$2.6	$2.9	$0.0	($0.3)	$0.1	$1.3	($0.0)	($1.2)	($1.5)	74	93
Brunner Island - Yorkana	Line	Met-Ed	($6.3)	($6.6)	($0.0)	$0.3	$0.1	($1.0)	$0.0	$1.0	$1.4	172	196

Table 7-28 PECO Control Zone top congestion cost impacts (By facility): Calendar year 2006

Congestion Costs (Millions)													
			Day Ahead				Balancing					Event Hours	
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$203.9	$226.0	($0.0)	($22.1)	$2.6	$13.7	($0.0)	($11.2)	($33.3)	3,875	1,812
Whitpain	Transformer	PECO	$24.0	$7.8	$0.2	$16.5	$0.9	$3.3	($0.3)	($2.7)	$13.7	193	125
5004/5005 Interface	Interface	500	$106.0	$113.4	$0.0	($7.4)	$0.7	$2.8	($0.0)	($2.2)	($9.6)	1,738	341
Cedar Grove - Roseland	Line	PSEG	($78.1)	($81.9)	$0.0	$3.8	($0.6)	($3.2)	($0.0)	$2.6	$6.4	3,692	541
AP South	Interface	500	$27.9	$31.8	($0.0)	($4.0)	$0.3	$2.7	($0.0)	($2.4)	($6.4)	639	237
West	Interface	500	$56.5	$60.9	($0.0)	($4.3)	$0.2	$2.1	($0.0)	($1.9)	($6.2)	981	328
Kammer	Transformer	500	$51.2	$55.5	($0.1)	($4.4)	$0.9	$2.6	($0.0)	($1.7)	($6.1)	2,043	688
Wylie Ridge	Transformer	AP	$36.7	$40.3	$0.0	($3.6)	$1.6	$3.7	($0.0)	($2.1)	($5.7)	2,286	1,084
Mount Storm - Pruntytown	Line	AP	$43.2	$46.1	($0.1)	($3.0)	$1.0	$2.7	($0.0)	($1.7)	($4.7)	891	465
Kanawha - Matt Funk	Line	AEP	$27.3	$30.0	($0.0)	($2.7)	$1.1	$2.6	($0.0)	($1.5)	($4.2)	2,025	617
Branchburg - Readington	Line	PSEG	($28.2)	($30.1)	($0.0)	$1.9	($0.2)	($2.4)	$0.0	$2.2	$4.1	704	480
Central	Interface	500	$36.3	$40.1	$0.0	($3.7)	$0.0	$0.1	($0.0)	($0.1)	($3.8)	699	15
East	Interface	500	$10.1	$6.4	$0.0	$3.7	$0.1	$0.0	($0.0)	$0.0	$3.8	324	11
Cloverdale - Lexington	Line	AEP	$26.6	$26.4	$0.0	$0.2	$3.9	$6.9	($0.0)	($3.0)	($2.8)	1,517	961
Doubs - Mount Storm	Line	500	$17.9	$19.7	$0.0	($1.8)	$0.1	$0.8	$0.0	($0.7)	($2.6)	240	50

PENELEC Control Zone

Table 7-29 and Table 7-30 show the constraints with the largest impacts on total congestion cost in the PENELEC Control Zone. In 2007, the Bedington — Black Oak and 5004/5005 interface constraints were the largest contributors to positive congestion while the Wylie Ridge and Kammer transformer constraints contributed to negative congestion. In 2006, the 5004/5005 Interface and Bedington — Black Oak constraints had been the largest contributors to positive congestion while the Wylie Ridge and Kammer transformer constraints contributed to negative congestion.

Table 7-29 PENELEC Control Zone top congestion cost impacts (By facility): Calendar year 2007

			Congestion Costs (Millions)									Event Hours	
			Day Ahead				Balancing						
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	($137.7)	($221.0)	$0.0	$83.4	($8.4)	$0.1	$0.4	($8.1)	$75.2	5,493	1,836
5004/5005 Interface	Interface	500	($36.9)	($84.5)	($1.0)	$46.6	($0.6)	$0.7	$0.4	($0.9)	$45.6	1,512	386
Wylie Ridge	Transformer	AP	$21.6	$41.5	$1.0	($18.9)	$2.7	($0.3)	($0.9)	$2.1	($16.9)	1,486	685
Kammer	Transformer	500	$26.4	$47.2	$1.5	($19.3)	$2.3	($0.7)	($0.5)	$2.5	($16.8)	2,005	947
Branchburg - Readington	Line	PSEG	($23.7)	($42.5)	($0.0)	$18.8	($5.4)	($0.3)	$0.2	($4.8)	$14.0	2,324	721
Central	Interface	500	($8.0)	($20.9)	($0.1)	$12.8	($0.0)	$0.0	$0.0	($0.0)	$12.8	1,334	25
Bedington	Transformer	AP	($8.4)	($14.8)	$0.0	$6.5	$0.2	$0.1	$0.1	$0.3	$6.8	928	429
Elrama - Mitchell	Line	AP	$6.5	$12.6	$0.3	($5.9)	$0.6	($0.4)	($0.2)	$0.7	($5.1)	1,883	784
AP South	Interface	500	($8.7)	($13.4)	$0.3	$4.9	$0.1	$0.0	($0.1)	($0.1)	$4.9	706	133
Cloverdale - Lexington	Line	AEP	$2.6	$8.1	$1.7	($3.8)	$1.6	$0.2	($1.6)	($0.3)	($4.0)	3,704	1,885
Seward	Transformer	PENELEC	$10.4	$7.0	$0.0	$3.5	$0.2	$0.1	$0.0	$0.1	$3.6	110	3
West	Interface	500	($4.7)	($10.6)	$0.0	$5.9	($0.7)	$1.7	$0.1	($2.3)	$3.6	359	338
East Towanda	Transformer	PENELEC	$7.5	($4.3)	$0.3	$12.1	($1.0)	$7.9	$0.1	($8.9)	$3.3	1,055	410
East	Interface	500	($3.8)	($6.6)	($0.0)	$2.8	($0.0)	($0.0)	($0.0)	($0.0)	$2.8	304	5
Bear Rock - Johnstown	Line	PENELEC	($3.6)	($5.8)	($0.0)	$2.1	$0.1	$0.2	$0.0	($0.1)	$2.0	212	21

Table 7-30 PENELEC Control Zone top congestion cost impacts (By facility): Calendar year 2006

			Congestion Costs (Millions)										
			Day Ahead				Balancing					Event Hours	
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
5004/5005 Interface	Interface	500	($51.4)	($97.4)	($0.2)	$45.9	($1.3)	($0.5)	$0.0	($0.8)	$45.1	1,738	341
Bedington - Black Oak	Interface	500	($49.2)	($73.8)	($0.4)	$24.2	($4.2)	($3.8)	$0.1	($0.3)	$23.8	3,875	1,812
Cedar Grove - Roseland	Line	PSEG	($44.6)	($65.7)	($0.2)	$20.8	($2.4)	($2.4)	($0.0)	($0.1)	$20.7	3,692	541
Wylie Ridge	Transformer	AP	$27.5	$45.7	$0.3	($17.9)	$3.0	$3.5	($0.9)	($1.4)	($19.3)	2,286	1,084
West	Interface	500	($21.2)	($39.6)	($0.2)	$18.1	($0.5)	($0.1)	$0.0	($0.4)	$17.7	981	328
Kammer	Transformer	500	$31.6	$47.5	$0.2	($15.7)	$1.9	$1.9	($0.3)	($0.2)	($15.9)	2,043	688
Central	Interface	500	($10.6)	($19.5)	$0.1	$8.9	($0.0)	$0.0	($0.0)	($0.0)	$8.9	699	15
Branchburg - Readington	Line	PSEG	($14.6)	($21.4)	($0.0)	$6.8	($2.1)	($2.5)	$0.0	$0.5	$7.3	704	480
Seward	Transformer	PENELEC	$25.8	$19.7	($0.1)	$6.0	$0.2	$0.3	($0.0)	($0.1)	$5.9	258	11
Kanawha - Matt Funk	Line	AEP	$8.3	$12.8	$0.0	($4.4)	$0.5	$1.1	($0.2)	($0.8)	($5.2)	2,025	617
Mount Storm - Pruntytown	Line	AP	($9.4)	($14.1)	($0.0)	$4.7	($0.7)	($0.6)	$0.0	($0.1)	$4.6	891	465
Goudey - Laurel Lake	Line	PENELEC	$0.1	$0.0	$0.0	$0.0	($3.4)	$0.8	($0.3)	($4.4)	($4.4)	13	53
Cloverdale - Lexington	Line	AEP	$5.7	$9.6	($0.0)	($3.9)	$1.1	$1.0	$0.0	$0.2	($3.7)	1,517	961
Bedington	Transformer	AP	($1.7)	($4.4)	($0.0)	$2.6	($0.5)	($0.7)	$0.0	$0.2	$2.8	662	451
Altoona - Johnstown	Line	PENELEC	($8.0)	($10.6)	($0.0)	$2.5	($0.1)	$0.1	$0.0	($0.1)	$2.4	107	8

Pepco Control Zone

Table 7-31 and Table 7-32 show the constraints with the largest impacts on total congestion cost in the Pepco Control Zone. In 2007, the Bedington — Black Oak and Cloverdale — Lexington constraints were the largest contributors to positive congestion while the Branchburg —Readington and Central interface constraints contributed to negative congestion. In 2006, the Bedington — Black Oak and Mount Storm — Pruntytown constraints had been the largest contributors to positive congestion while the Cedar Grove — Roseland and Branchburg — Readington constraints contributed to negative congestion.

Table 7-31 Pepco Control Zone top congestion cost impacts (By facility): Calendar year 2007

			Congestion Costs (Millions)										
			Day Ahead				Balancing					Event Hours	
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$455.4	$381.3	$5.6	$79.7	$312.9	$284.9	($5.1)	$22.9	$102.6	5,493	1,836
Cloverdale - Lexington	Line	AEP	$136.7	$114.8	$2.0	$23.9	$121.1	$105.0	($2.3)	$13.8	$37.7	3,704	1,885
Kammer	Transformer	500	$47.3	$38.3	$0.7	$9.6	$40.9	$37.3	($0.9)	$2.6	$12.3	2,005	947
AP South	Interface	500	$50.4	$41.3	$0.7	$9.9	$26.2	$24.6	($0.2)	$1.4	$11.3	706	133
Branchburg - Readington	Line	PSEG	($49.8)	($44.3)	($0.2)	($5.8)	($46.8)	($41.1)	$0.4	($5.3)	($11.1)	2,324	721
Wylie Ridge	Transformer	AP	$20.3	$17.2	$0.6	$3.7	$17.9	$15.7	($0.6)	$1.6	$5.4	1,486	685
Bedington	Transformer	AP	$20.6	$16.5	$1.2	$5.3	$16.5	$15.6	($1.0)	($0.1)	$5.1	928	429
Aqueduct - Doubs	Line	AP	$16.0	$11.9	$0.3	$4.3	$2.9	$2.9	($0.1)	($0.0)	$4.3	262	21
5004/5005 Interface	Interface	500	$11.6	$9.0	$0.3	$2.9	$3.0	$2.8	($0.1)	$0.1	$3.0	1,512	386
Central	Interface	500	($20.0)	($17.2)	($0.1)	($2.9)	($0.4)	($0.4)	$0.0	($0.0)	($3.0)	1,334	25
Doubs	Transformer	AP	$12.1	$9.3	$0.2	$3.1	$10.7	$10.7	($0.6)	($0.7)	$2.4	135	99
Brunner Island - Yorkana	Line	Met-Ed	$6.5	$5.2	$0.3	$1.6	$17.0	$15.7	($0.8)	$0.5	$2.1	172	196
Bedington - Nipetown	Line	AP	$6.9	$5.7	$0.1	$1.3	$6.2	$5.5	($0.0)	$0.7	$1.9	841	175
Mount Storm - Pruntytown	Line	AP	$1.2	$1.0	$0.0	$0.2	$19.9	$18.1	($0.3)	$1.5	$1.7	33	151
Elrama - Mitchell	Line	AP	$5.8	$4.6	$0.2	$1.3	$7.5	$6.8	($0.4)	$0.4	$1.7	1,883	784

Table 7-32 Pepco Control Zone top congestion cost impacts (By facility): Calendar year 2006

			Congestion Costs (Millions)										
			Day Ahead				Balancing					Event Hours	
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$434.0	$363.1	$1.3	$72.2	$291.8	$277.3	($1.0)	$13.5	$85.7	3,875	1,812
Mount Storm - Pruntytown	Line	AP	$95.0	$79.9	$0.4	$15.4	$53.1	$51.8	($0.2)	$1.0	$16.5	891	465
AP South	Interface	500	$51.8	$41.2	$0.2	$10.8	$60.9	$57.8	($0.4)	$2.7	$13.5	639	237
Cloverdale - Lexington	Line	AEP	$45.0	$37.6	$0.0	$7.4	$65.3	$61.1	($0.2)	$4.0	$11.4	1,517	961
Cedar Grove - Roseland	Line	PSEG	($57.4)	($47.7)	($0.3)	($10.0)	($20.4)	($19.7)	$0.1	($0.6)	($10.6)	3,692	541
Aqueduct - Doubs	Line	AP	$54.0	$43.5	$0.1	$10.6	$25.4	$25.6	($0.2)	($0.4)	$10.3	362	127
Kammer	Transformer	500	$46.5	$38.6	$0.1	$8.0	$23.4	$21.5	($0.1)	$1.8	$9.8	2,043	688
Kanawha - Matt Funk	Line	AEP	$45.7	$38.0	$0.2	$7.9	$28.8	$27.3	($0.1)	$1.4	$9.3	2,025	617
Doubs - Mount Storm	Line	500	$29.6	$25.0	($0.1)	$4.6	$13.1	$11.7	($0.0)	$1.4	$6.0	240	50
Doubs	Transformer	AP	$33.2	$27.3	($0.0)	$5.9	$13.2	$13.2	($0.1)	($0.1)	$5.8	90	74
Wylie Ridge	Transformer	AP	$22.1	$18.0	$0.1	$4.2	$21.8	$20.7	($0.3)	$0.8	$5.0	2,286	1,084
West	Interface	500	$18.8	$15.4	$0.0	$3.4	$8.2	$7.9	($0.1)	$0.2	$3.6	981	328
Bedington	Transformer	AP	$14.6	$11.6	$0.2	$3.3	$24.4	$23.9	($0.3)	$0.2	$3.5	662	451
Dickerson - Doubs	Line	Pepco	$17.5	$14.2	($0.0)	$3.3	$2.9	$2.8	($0.0)	$0.1	$3.4	116	11
Branchburg - Readington	Line	PSEG	($19.6)	($16.8)	($0.0)	($2.8)	($28.7)	($28.1)	$0.1	($0.6)	($3.3)	704	480

PPL Control Zone

Table 7-33 and Table 7-34 show the constraints with the largest impacts on total congestion cost in the PPL Control Zone. In 2007, the Bedington — Black Oak and Brunner Island — Yorkana constraints were the largest contributors to positive congestion while the 5004/5005 Interface and Cloverdale — Lexington constraints contributed to negative congestion. In 2006, the Cedar Grove — Roseland and East interface constraints had been the largest contributors to positive congestion while the 5004/5005 and Bedington — Black Oak constraints contributed to negative congestion.

Table 7-33 PPL Control Zone top congestion cost impacts (By facility): Calendar year 2007

			Congestion Costs (Millions)									Event Hours	
			Day Ahead				Balancing						
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
5004/5005 Interface	Interface	500	$91.9	$102.7	$1.2	($9.6)	$2.5	$3.1	($0.2)	($0.7)	($10.3)	1,512	386
Bedington - Black Oak	Interface	500	$109.1	$105.7	$2.2	$5.6	$6.2	$6.7	$1.1	$0.6	$6.3	5,493	1,836
Cloverdale - Lexington	Line	AEP	$67.4	$75.3	$1.5	($6.5)	$5.5	$5.5	$0.5	$0.5	($6.0)	3,704	1,885
Central	Interface	500	$35.1	$40.3	$0.5	($4.6)	$0.1	$0.1	$0.0	$0.0	($4.6)	1,334	25
Brunner Island - Yorkana	Line	Met-Ed	($10.3)	($15.1)	($0.1)	$4.7	($1.9)	($0.6)	($0.0)	($1.3)	$3.5	172	196
Branchburg - Readington	Line	PSEG	($52.1)	($57.2)	($0.2)	$4.9	($3.8)	($3.4)	($1.2)	($1.6)	$3.2	2,324	721
Kammer	Transformer	500	$48.9	$53.1	$0.8	($3.4)	$4.0	$4.1	$0.4	$0.3	($3.1)	2,005	947
Manor - Safe Harbor	Line	Met-Ed	$4.1	$1.3	$0.0	$2.8	$0.0	$0.0	$0.0	$0.0	$2.8	95	0
Conastone	Transformer	BGE	$0.2	($2.5)	($0.0)	$2.7	$0.1	$0.1	($0.0)	($0.0)	$2.7	172	55
Wylie Ridge	Transformer	AP	$37.1	$41.0	$0.6	($3.2)	$3.0	$2.5	($0.0)	$0.5	($2.7)	1,486	685
East	Interface	500	($2.0)	($4.1)	($0.0)	$2.1	$0.0	$0.0	($0.0)	($0.0)	$2.1	304	5
Cedar Grove - Roseland	Line	PSEG	($15.3)	($17.1)	($0.1)	$1.7	($0.3)	($0.3)	$0.0	($0.1)	$1.6	1,677	133
West	Interface	500	$15.3	$16.4	$0.2	($0.9)	$2.7	$3.4	$0.2	($0.6)	($1.5)	359	338
PL North	Interface	PPL	$0.0	$0.0	$0.0	$0.0	($0.9)	$0.3	($0.1)	($1.3)	($1.3)	0	93
Elrama - Mitchell	Line	AP	$9.3	$10.5	$0.2	($1.1)	$0.8	$1.0	$0.0	($0.2)	($1.3)	1,883	784

Table 7-34 PPL Control Zone top congestion cost impacts (By facility): Calendar year 2006

			Congestion Costs (Millions)										
			Day Ahead				Balancing					Event Hours	
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
5004/5005 Interface	Interface	500	$100.5	$112.9	($0.8)	($13.2)	$3.7	$4.9	$0.2	($1.0)	($14.2)	1,738	341
Bedington - Black Oak	Interface	500	$154.6	$161.2	($0.7)	($7.2)	$10.5	$12.3	$0.5	($1.2)	($8.4)	3,875	1,812
Cedar Grove - Roseland	Line	PSEG	($82.3)	($89.6)	$0.3	$7.6	($3.1)	($3.4)	($0.3)	($0.0)	$7.6	3,692	541
West	Interface	500	$52.8	$57.0	($0.4)	($4.5)	$2.5	$2.3	($0.0)	$0.2	($4.3)	981	328
Central	Interface	500	$20.6	$24.7	($0.1)	($4.2)	$0.1	$0.1	$0.0	($0.0)	($4.2)	699	15
Wylie Ridge	Transformer	AP	$35.4	$38.1	($0.2)	($2.8)	$3.5	$4.3	$0.2	($0.6)	($3.4)	2,286	1,084
Cloverdale - Lexington	Line	AEP	$21.4	$24.8	($0.1)	($3.5)	$3.9	$3.9	$0.2	$0.2	($3.3)	1,517	961
Kanawha - Matt Funk	Line	AEP	$25.9	$28.1	($0.2)	($2.4)	$1.7	$2.5	$0.0	($0.8)	($3.2)	2,025	617
Kammer	Transformer	500	$47.7	$50.0	($0.4)	($2.6)	$2.5	$2.7	$0.1	($0.2)	($2.9)	2,043	688
Mount Storm - Pruntytown	Line	AP	$30.1	$32.4	($0.2)	($2.5)	$1.7	$2.1	$0.0	($0.4)	($2.8)	891	465
AP South	Interface	500	$22.1	$23.3	($0.0)	($1.2)	$2.3	$3.1	$0.1	($0.6)	($1.9)	639	237
East	Interface	500	($1.9)	($3.6)	($0.0)	$1.6	($0.0)	($0.0)	($0.0)	($0.0)	$1.6	324	11
Branchburg - Readington	Line	PSEG	($21.5)	($23.7)	$0.1	$2.2	($3.6)	($3.4)	($0.7)	($0.9)	$1.3	704	480
Doubs - Mount Storm	Line	500	$12.6	$13.6	($0.0)	($1.0)	$0.6	$0.8	$0.0	($0.1)	($1.1)	240	50
Conastone	Transformer	BGE	$1.4	$0.8	$0.0	$0.6	$0.2	($0.0)	$0.1	$0.3	$0.9	99	27

PSEG Control Zone

Table 7-35 and Table 7-36 show the constraints with the largest impacts on total congestion cost in the PSEG Control Zone. In 2007, the Branchburg — Readington and Cedar Grove — Roseland constraints were the largest contributors to positive congestion while the Bedington — Black Oak and South Mahwah — Waldwick constraints contributed to negative congestion. In 2006, the Cedar Grove — Roseland and 5004/5005 interface constraints had been the largest contributors to positive congestion while the Cedar Grove — Clifton and South Mahwah — Waldwick constraints contributed to negative congestion.

Table 7-35 PSEG Control Zone top congestion cost impacts (By facility): Calendar year 2007

			Congestion Costs (Millions)									Event Hours	
			Day Ahead				Balancing						
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Branchburg - Readington	Line	PSEG	$42.2	($8.7)	$0.3	$51.2	$56.6	$65.5	($2.5)	($11.4)	$39.8	2,324	721
Cedar Grove - Roseland	Line	PSEG	$17.6	$3.7	($0.3)	$13.6	$5.6	$5.8	($0.1)	($0.4)	$13.2	1,677	133
Branchburg - Flagtown	Line	PSEG	$11.4	$1.5	$0.3	$10.2	$16.7	$16.4	($0.8)	($0.5)	$9.7	580	104
Bedington - Black Oak	Interface	500	$59.1	$67.4	$5.0	($3.3)	$39.4	$41.6	($3.2)	($5.3)	($8.6)	5,493	1,836
Atlantic - Larrabee	Line	JCPL	$6.8	($2.6)	$0.2	$9.6	$11.6	$12.3	($0.6)	($1.4)	$8.2	680	134
South Mahwah - Waldwick	Line	PSEG	$3.9	$2.3	($0.9)	$0.7	$15.6	$18.6	($4.9)	($8.0)	($7.3)	304	58
5004/5005 Interface	Interface	500	$49.7	$45.9	$2.0	$5.7	$27.4	$27.0	($0.7)	($0.3)	$5.4	1,512	386
Brunswick - Edison	Line	PSEG	$4.9	$0.7	$0.2	$4.4	$2.1	$2.0	($0.1)	($0.0)	$4.4	667	125
Edison - Meadow Rd	Line	PSEG	$4.0	$0.6	$0.3	$3.7	$4.0	$3.9	($0.2)	($0.2)	$3.5	438	143
Wylie Ridge	Transformer	AP	$21.5	$18.8	$1.0	$3.6	$24.2	$24.9	($0.9)	($1.7)	$1.9	1,486	685
Linden - North Ave	Line	PSEG	$1.1	($0.6)	$0.1	$1.7	$0.0	$0.0	($0.0)	$0.0	$1.7	421	1
Cloverdale - Lexington	Line	AEP	$39.8	$39.4	$2.3	$2.7	$45.4	$47.9	($1.9)	($4.3)	($1.6)	3,704	1,885
Central	Interface	500	$27.8	$27.1	$0.9	$1.6	$1.1	$1.1	($0.0)	$0.0	$1.6	1,334	25
Bergen - Hoboken	Line	PSEG	$0.5	($0.3)	$0.7	$1.5	$0.0	$0.0	($0.0)	$0.0	$1.5	210	9
Athenia - Saddlebrook	Line	PSEG	$1.3	$1.0	$0.9	$1.2	$1.0	$1.0	$0.0	$0.0	$1.2	173	15

Table 7-36 PSEG Control Zone top congestion cost impacts (By facility): Calendar year 2006

			Congestion Costs (Millions)									Event Hours	
			Day Ahead				Balancing						
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Cedar Grove - Roseland	Line	PSEG	$11.6	($17.2)	($0.3)	$28.5	$6.4	$8.7	($0.4)	($2.7)	$25.8	3,692	541
5004/5005 Interface	Interface	500	$59.4	$55.5	$4.1	$8.1	$35.8	$33.6	($0.6)	$1.6	$9.6	1,738	341
Edison - Meadow Rd	Line	PSEG	$9.7	$1.5	$0.7	$9.0	$15.4	$15.1	($0.8)	($0.5)	$8.4	875	634
Branchburg - Readington	Line	PSEG	$4.2	($5.5)	$0.2	$10.0	$11.0	$12.5	($0.7)	($2.2)	$7.8	704	480
Bergen - Hoboken	Line	PSEG	$0.4	($1.6)	$2.8	$4.8	($0.1)	($0.1)	($0.1)	($0.1)	$4.7	681	108
Cedar Grove - Clifton	Line	PSEG	$1.0	$0.0	$0.4	$1.3	$20.0	$22.8	($2.4)	($5.2)	($3.9)	168	536
Brunswick - Edison	Line	PSEG	$3.6	$0.5	$0.3	$3.3	$3.1	$3.0	($0.2)	($0.1)	$3.3	464	206
Bergen - Leonia	Line	PSEG	$1.1	$1.0	$2.3	$2.4	$0.7	$0.5	($0.2)	($0.0)	$2.4	948	52
Whitpain	Transformer	PECO	$5.2	$3.7	$0.3	$1.8	$8.0	$7.5	($0.1)	$0.4	$2.1	193	125
AP South	Interface	500	$13.8	$13.7	$0.8	$0.9	$24.6	$23.2	($0.3)	$1.2	$2.1	639	237
Wylie Ridge	Transformer	AP	$20.9	$19.2	$1.1	$2.7	$28.3	$28.6	($0.5)	($0.8)	$1.9	2,286	1,084
South Mahwah - Waldwick	Line	PSEG	$0.0	$0.0	$0.0	$0.0	$7.0	$7.1	($1.4)	($1.6)	($1.6)	0	37
Bedington - Black Oak	Interface	500	$93.8	$98.5	$5.4	$0.6	$98.1	$95.7	($1.6)	$0.8	$1.5	3,875	1,812
Unclassified	Unclassified	Unclassified	$1.7	$0.7	$0.5	$1.4	$0.0	$0.0	$0.0	$0.0	$1.4	NA	NA
Bayway - Doremus	Line	PSEG	$0.3	($0.9)	$0.2	$1.4	$0.0	$0.0	($0.0)	$0.0	$1.4	418	2

RECO Control Zone

Table 7-37 and Table 7-38 show the constraints with the largest impacts on total congestion cost in the RECO Control Zone. In 2007, the Branchburg — Readington and 5004/5005 interface constraints were the largest contributors to positive congestion while the South Mahwah — Waldwick and Brunner Island — Yorkana constraints contributed to negative congestion. In 2006, the Bedington — Black Oak and Cedar Grove — Roseland constraints had been the largest contributors to positive congestion. No constraints were significant contributors to negative congestion during 2006.

Table 7-37 RECO Control Zone top congestion cost impacts (By facility): Calendar year 2007

			Congestion Costs (Millions)									Event Hours	
			Day Ahead				Balancing						
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Branchburg - Readington	Line	PSEG	$2.9	$0.1	$0.2	$3.1	$4.1	$4.0	($0.3)	($0.2)	$2.9	2,324	721
5004/5005 Interface	Interface	500	$1.3	$0.1	$0.0	$1.2	$0.9	$0.8	($0.0)	$0.1	$1.3	1,512	386
Cedar Grove - Roseland	Line	PSEG	$1.1	$0.0	$0.0	$1.0	$0.4	$0.4	($0.0)	$0.1	$1.1	1,677	133
Cloverdale - Lexington	Line	AEP	$0.8	$0.1	$0.0	$0.8	$1.2	$1.1	($0.0)	$0.1	$0.9	3,704	1,885
Bedington - Black Oak	Interface	500	$1.0	$0.0	$0.0	$0.9	$0.4	$0.4	($0.1)	($0.1)	$0.9	5,493	1,836
South Mahwah - Waldwick	Line	PSEG	($0.1)	($0.0)	($0.0)	($0.2)	($0.8)	($0.1)	$0.0	($0.7)	($0.8)	304	58
Kammer	Transformer	500	$0.7	$0.0	$0.0	$0.7	$1.1	$1.0	($0.0)	$0.1	$0.8	2,005	947
Central	Interface	500	$0.7	$0.0	$0.0	$0.7	$0.0	$0.0	$0.0	$0.0	$0.7	1,334	25
Wylie Ridge	Transformer	AP	$0.6	$0.0	$0.0	$0.6	$0.7	$0.7	($0.0)	$0.0	$0.6	1,486	685
Atlantic - Larrabee	Line	JCPL	$0.3	$0.0	$0.0	$0.3	$0.5	$0.5	$0.0	$0.0	$0.3	680	134
West	Interface	500	$0.2	$0.0	$0.0	$0.2	$0.6	$0.6	($0.0)	$0.0	$0.3	359	338
AP South	Interface	500	$0.3	$0.1	$0.0	$0.2	$0.2	$0.1	($0.0)	$0.0	$0.2	706	133
East	Interface	500	$0.2	$0.0	$0.0	$0.2	$0.0	$0.0	$0.0	$0.0	$0.2	304	5
Brunner Island - Yorkana	Line	Met-Ed	($0.2)	($0.0)	$0.0	($0.2)	($0.5)	($0.5)	$0.0	($0.0)	($0.2)	172	196
Branchburg - Flagtown	Line	PSEG	$0.2	$0.0	$0.0	$0.2	$0.3	$0.3	($0.0)	$0.0	$0.2	580	104

Table 7-38 RECO Control Zone top congestion cost impacts (By facility): Calendar year 2006

			Congestion Costs (Millions)									Event Hours	
			Day Ahead				Balancing						
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$2.3	$0.1	$0.2	$2.3	$2.6	$2.3	($0.2)	$0.1	$2.4	3,875	1,812
Cedar Grove - Roseland	Line	PSEG	$1.6	$0.0	$0.1	$1.7	$0.9	$0.9	($0.1)	($0.0)	$1.6	3,692	541
5004/5005 Interface	Interface	500	$1.6	$0.3	$0.0	$1.4	$1.1	$0.8	($0.1)	$0.2	$1.6	1,738	341
West	Interface	500	$0.7	$0.0	$0.1	$0.7	$0.6	$0.6	($0.0)	$0.0	$0.8	981	328
Kammer	Transformer	500	$0.6	$0.0	$0.0	$0.6	$0.6	$0.5	($0.1)	$0.0	$0.7	2,043	688
Mount Storm - Pruntytown	Line	AP	$0.5	$0.0	$0.1	$0.6	$0.4	$0.4	($0.1)	($0.0)	$0.5	891	465
AP South	Interface	500	$0.3	$0.0	$0.0	$0.4	$0.7	$0.5	($0.0)	$0.2	$0.5	639	237
Central	Interface	500	$0.5	$0.0	$0.0	$0.5	$0.0	$0.0	$0.0	$0.0	$0.5	699	15
Wylie Ridge	Transformer	AP	$0.5	$0.0	$0.0	$0.5	$0.8	$0.7	($0.1)	($0.0)	$0.5	2,286	1,084
Branchburg - Readington	Line	PSEG	$0.5	$0.0	$0.0	$0.5	$1.3	$1.3	($0.1)	($0.1)	$0.5	704	480
Kanawha - Matt Funk	Line	AEP	$0.4	$0.0	$0.0	$0.4	$0.4	$0.3	($0.0)	($0.0)	$0.4	2,025	617
Cloverdale - Lexington	Line	AEP	$0.3	$0.0	$0.0	$0.3	$0.8	$0.7	($0.1)	($0.0)	$0.3	1,517	961
Doubs - Mount Storm	Line	500	$0.3	$0.0	$0.0	$0.2	$0.2	$0.1	($0.0)	$0.0	$0.2	240	50
Aqueduct - Doubs	Line	AP	$0.1	$0.0	$0.0	$0.1	$0.1	$0.1	($0.0)	$0.0	$0.1	362	127
Axton	Transformer	AEP	$0.2	$0.0	$0.0	$0.1	$0.0	$0.0	($0.0)	($0.0)	$0.1	218	35

Western Region Congestion-Event Summaries

AEP Control Zone

Table 7-39 and Table 7-40 show the constraints with the largest impacts on total congestion cost in the AEP Control Zone. In 2007, the Bedington — Black Oak and Kammer transformer constraints were the largest contributors to positive congestion while the Cloverdale — Lexington and Darwin — Eugene constraints contributed to negative congestion. In 2006, the Bedington — Black Oak and Kanawha — Matt Funk constraints had been the largest contributors to positive congestion while the Cloverdale — Lexington constraint contributed to negative congestion.

Table 7-39 AEP Control Zone top congestion cost impacts (By facility): Calendar year 2007

			Congestion Costs (Millions)									Event Hours	
			Day Ahead				Balancing						
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	($405.4)	($519.1)	$7.3	$120.9	($322.4)	($287.5)	($0.3)	($35.2)	$85.7	5,493	1,836
Kammer	Transformer	500	($131.9)	($168.1)	($0.2)	$36.0	($146.0)	($133.4)	$0.0	($12.6)	$23.4	2,005	947
Amos	Transformer	AEP	$14.1	($3.4)	$0.3	$17.8	$38.8	$38.3	($0.2)	$0.2	$18.0	311	132
5004/5005 Interface	Interface	500	($101.9)	($118.6)	$0.5	$17.3	($46.9)	($43.9)	($0.1)	($3.1)	$14.2	1,512	386
Cloverdale - Lexington	Line	AEP	($271.5)	($274.8)	($5.3)	($2.0)	($276.8)	($265.4)	$0.2	($11.2)	($13.1)	3,704	1,885
Axton	Transformer	AEP	($5.5)	($12.8)	$1.0	$8.3	$0.0	$0.0	$0.0	$0.0	$8.3	238	0
AP South	Interface	500	($62.9)	($73.6)	$0.3	$11.0	($44.9)	($40.8)	$0.0	($4.1)	$6.9	706	133
Wylie Ridge	Transformer	AP	($72.7)	($86.7)	$1.3	$15.3	($77.6)	($68.6)	($0.2)	($9.2)	$6.1	1,486	685
Central	Interface	500	($47.7)	($53.5)	$0.0	$5.8	($1.5)	($1.4)	$0.0	($0.0)	$5.8	1,334	25
Bedington	Transformer	AP	($33.2)	($40.4)	$0.4	$7.6	($30.3)	($28.2)	($0.0)	($2.1)	$5.5	928	429
Kanawha - Matt Funk	Line	AEP	($14.4)	($21.0)	$0.9	$7.5	($12.9)	($10.2)	($0.2)	($2.8)	$4.7	90	95
Axton - Jacksons Ferry	Line	AEP	($3.4)	($7.5)	$0.6	$4.8	($0.3)	($0.2)	($0.0)	($0.2)	$4.6	238	5
Kanawha River	Transformer	AEP	$1.0	($1.9)	$0.6	$3.5	$0.4	$0.4	$0.0	($0.0)	$3.5	63	12
Darwin - Eugene	Line	AEP	($0.0)	($3.0)	($0.1)	$2.9	$2.0	$8.0	($0.1)	($6.1)	($3.3)	109	227
Cloverdale	Transformer	AEP	($10.6)	($14.6)	$0.2	$4.2	($14.4)	($12.3)	($0.0)	($2.1)	$2.2	233	152

Table 7-40 AEP Control Zone top congestion cost impacts (By facility): Calendar year 2006

			Congestion Costs (Millions)										
			Day Ahead				Balancing					Event Hours	
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	($107.1)	($170.9)	$6.1	$69.9	($77.5)	($64.7)	($0.1)	($12.9)	$57.0	3,875	1,812
Kanawha - Matt Funk	Line	AEP	($12.4)	($69.5)	$1.3	$58.4	($5.4)	$3.9	($2.2)	($11.5)	$46.9	2,025	617
Kammer	Transformer	500	($101.0)	($126.1)	$3.3	$28.4	($65.5)	($61.7)	$0.2	($3.6)	$24.7	2,043	688
Axton	Transformer	AEP	($1.3)	($18.6)	$2.7	$20.0	$0.1	$0.6	$0.0	($0.5)	$19.5	218	35
Mount Storm - Pruntytown	Line	AP	($17.0)	($33.7)	$1.7	$18.4	($8.4)	($6.5)	$0.1	($1.8)	$16.6	891	465
5004/5005 Interface	Interface	500	($106.1)	($119.1)	($0.5)	$12.5	($45.2)	($45.2)	$0.1	$0.1	$12.6	1,738	341
Axton - Jacksons Ferry	Line	AEP	($0.4)	($8.2)	$1.0	$8.8	$0.0	$0.1	$0.0	($0.1)	$8.7	380	10
Cedar Grove - Roseland	Line	PSEG	($104.8)	($111.6)	$1.9	$8.8	($48.4)	($47.7)	$0.0	($0.6)	$8.2	3,692	541
Wylie Ridge	Transformer	AP	($63.3)	($74.7)	$2.6	$14.1	($76.1)	($70.1)	($0.5)	($6.6)	$7.5	2,286	1,084
Cloverdale - Lexington	Line	AEP	($60.3)	($58.6)	($1.4)	($3.0)	($113.6)	($110.9)	$0.1	($2.6)	($5.7)	1,517	961
Central	Interface	500	($37.5)	($42.6)	($0.2)	$4.9	($1.1)	($1.1)	$0.0	$0.0	$4.9	699	15
AP South	Interface	500	($33.0)	($37.9)	$0.4	$5.3	($38.6)	($37.2)	$0.2	($1.2)	$4.2	639	237
Bedington	Transformer	AP	($14.5)	($18.4)	$0.3	$4.3	($3.6)	($3.0)	$0.0	($0.6)	$3.7	662	451
Breed - Wheatland	Line	AEP	($0.5)	($4.1)	$0.2	$3.8	$0.1	$0.2	($0.1)	($0.3)	$3.5	411	29
West	Interface	500	($59.4)	($64.0)	$1.3	$5.9	($42.5)	($40.1)	($0.0)	($2.5)	$3.4	981	328

AP Control Zone

Table 7-41 and Table 7-42 show the constraints with the largest impacts on total congestion cost in the AP Control Zone. In 2007, the Bedington — Black Oak and Cloverdale — Lexington constraints were the largest contributors to positive congestion while the Kammer and Wylie Ridge transformer constraints contributed to negative congestion. In 2006, the Bedington — Black Oak, Meadowbrook transformer and Mount Storm — Pruntytown constraints had been the largest contributors to positive congestion while the Kammer transformer and Aqueduct — Doubs constraints contributed to negative congestion.

Table 7-41 AP Control Zone top congestion cost impacts (By facility): Calendar year 2007

			Congestion Costs (Millions)										
			Day Ahead				Balancing					Event Hours	
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	($33.0)	($290.3)	$4.3	$261.5	($16.3)	$8.3	$3.4	($21.3)	$240.2	5,493	1,836
Cloverdale - Lexington	Line	AEP	$27.6	($19.7)	$7.0	$54.3	$10.1	$13.3	($4.4)	($7.6)	$46.7	3,704	1,885
Meadow Brook	Transformer	AP	$33.5	$1.1	$0.6	$33.0	$8.6	$8.5	($0.2)	($0.1)	$32.9	868	233
Bedington	Transformer	AP	$21.3	($12.9)	($0.1)	$34.1	$9.4	$12.0	($0.5)	($3.1)	$31.0	928	429
AP South	Interface	500	$1.7	($23.0)	$0.6	$25.3	($0.2)	$1.5	$0.2	($1.6)	$23.7	706	133
Branchburg - Readington	Line	PSEG	($24.4)	($28.1)	$8.9	$12.6	($15.6)	($14.4)	$0.6	($0.6)	$12.0	2,324	721
5004/5005 Interface	Interface	500	($26.3)	($35.9)	$0.2	$9.7	($6.3)	($6.0)	$0.2	($0.1)	$9.6	1,512	386
Kammer	Transformer	500	$31.1	$43.5	$4.4	($8.0)	$13.7	$11.4	($3.8)	($1.5)	($9.5)	2,005	947
Elrama - Mitchell	Line	AP	$11.5	$3.9	$3.4	$11.0	$6.4	$7.8	($2.2)	($3.6)	$7.4	1,883	784
Bedington - Nipetown	Line	AP	$4.8	($2.9)	$0.2	$7.9	$1.8	$2.9	$0.1	($1.1)	$6.9	841	175
Wylie Ridge	Transformer	AP	$10.6	$14.0	$3.0	($0.4)	$4.3	$6.3	($3.6)	($5.5)	($5.9)	1,486	685
Doubs	Transformer	AP	$4.1	($1.5)	$0.1	$5.7	$2.7	$2.5	($0.2)	($0.0)	$5.7	135	99
Cedar Grove - Roseland	Line	PSEG	$1.4	($2.6)	$1.3	$5.3	($0.4)	($0.3)	$0.1	$0.1	$5.4	1,677	133
Central	Interface	500	($13.5)	($16.3)	$1.3	$4.1	($0.2)	($0.2)	$0.0	($0.0)	$4.1	1,334	25
Aqueduct - Doubs	Line	AP	($6.8)	($3.7)	($0.3)	($3.4)	($0.7)	($0.8)	$0.0	$0.1	($3.2)	262	21

Table 7-42 AP Control Zone top congestion cost impacts (By facility): Calendar year 2006

			Congestion Costs (Millions)										
			Day Ahead				Balancing					Event Hours	
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$28.4	($153.7)	($4.4)	$177.8	$6.6	$18.4	$2.3	($9.4)	$168.4	3,875	1,812
Meadow Brook	Transformer	AP	$42.4	$3.0	($0.6)	$38.9	$1.5	$1.1	$0.1	$0.5	$39.4	726	124
Mount Storm - Pruntytown	Line	AP	$5.2	($34.5)	($0.5)	$39.2	$1.1	$1.6	$0.6	$0.1	$39.4	891	465
Bedington	Transformer	AP	$27.6	($3.4)	($0.2)	$30.8	$5.3	$8.8	$0.5	($3.1)	$27.7	662	451
AP South	Interface	500	$7.0	($14.6)	($0.1)	$21.5	$2.7	$4.1	($0.2)	($1.6)	$19.9	639	237
Doubs	Transformer	AP	$10.3	($3.7)	($0.0)	$14.0	$1.4	$1.3	($0.0)	$0.2	$14.2	90	74
Kammer	Transformer	500	$30.7	$42.9	$0.2	($12.1)	$1.4	$2.1	($0.1)	($0.7)	($12.8)	2,043	688
Cloverdale - Lexington	Line	AEP	$11.0	($2.1)	$1.0	$14.1	$0.7	$4.2	($0.4)	($3.9)	$10.2	1,517	961
Aqueduct - Doubs	Line	AP	($15.3)	($5.7)	($0.2)	($9.8)	($1.2)	($1.2)	($0.0)	($0.0)	($9.8)	362	127
Kanawha - Matt Funk	Line	AEP	$12.3	$3.2	$0.6	$9.7	$0.6	$1.9	($0.1)	($1.4)	$8.3	2,025	617
Doubs - Mount Storm	Line	500	$2.4	($6.1)	($0.5)	$8.0	$0.2	$1.0	($0.2)	($1.0)	$7.0	240	50
Wylie Ridge	Transformer	AP	$12.4	$14.3	$1.3	($0.6)	($0.6)	$2.9	($2.8)	($6.3)	($6.9)	2,286	1,084
Cedar Grove - Roseland	Line	PSEG	($32.7)	($37.7)	$0.6	$5.6	($2.1)	($1.4)	$0.8	$0.2	$5.8	3,692	541
Branchburg - Readington	Line	PSEG	($11.2)	($11.9)	$0.4	$1.1	($3.8)	($0.9)	($1.7)	($4.7)	($3.5)	704	480
Fort Martin - Pruntytown	Line	500	$2.0	($1.4)	$0.1	$3.4	$0.0	$0.2	($0.0)	($0.3)	$3.2	111	22

ComEd Control Zone

Table 7-43 and Table 7-44 show the constraints with the largest impacts on total congestion cost in the ComEd Control Zone. In 2007, the Bedington — Black Oak and Cloverdale — Lexington constraints were the largest contributors to positive congestion while the South Mahwah — Waldwick constraint contributed to negative congestion. In 2006, the Kammer transformer and Cloverdale — Lexington constraints had been the largest contributors to positive congestion while the Northwest — Devon constraint contributed to negative congestion.

Table 7-43 ComEd Control Zone top congestion cost impacts (By facility): Calendar year 2007

			Congestion Costs (Millions)										
			Day Ahead				Balancing					Event Hours	
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	($463.0)	($490.0)	($0.6)	$26.5	($229.0)	($247.8)	$0.2	$19.1	$45.5	5,493	1,836
Cloverdale - Lexington	Line	AEP	($273.3)	($299.8)	($0.1)	$26.4	($158.3)	($175.5)	($0.1)	$17.2	$43.6	3,704	1,885
Kammer	Transformer	500	($167.1)	($178.7)	($0.1)	$11.5	($102.4)	($113.1)	($0.0)	$10.7	$22.2	2,005	947
Branchburg - Readington	Line	PSEG	($87.9)	($88.4)	$0.0	$0.5	($59.5)	($69.0)	$0.0	$9.5	$10.0	2,324	721
Wylie Ridge	Transformer	AP	($71.8)	($74.6)	($0.0)	$2.8	($43.9)	($50.3)	$0.0	$6.5	$9.2	1,486	685
5004/5005 Interface	Interface	500	($110.9)	($116.1)	($0.0)	$5.2	($31.7)	($33.9)	$0.0	$2.2	$7.5	1,512	386
AP South	Interface	500	($67.6)	($70.2)	($0.0)	$2.5	($27.3)	($29.2)	$0.0	$1.9	$4.4	706	133
Central	Interface	500	($51.9)	($54.9)	$0.0	$3.0	($0.9)	($0.9)	($0.0)	$0.0	$3.0	1,334	25
West	Interface	500	($18.9)	($19.1)	($0.0)	$0.1	($28.8)	($31.1)	$0.0	$2.3	$2.5	359	338
Kanawha - Matt Funk	Line	AEP	($20.3)	($22.1)	($0.0)	$1.8	($13.3)	($13.9)	$0.0	$0.6	$2.3	90	95
Cloverdale	Transformer	AEP	($15.2)	($16.9)	($0.0)	$1.7	($14.8)	($15.2)	$0.0	$0.5	$2.2	233	152
Elrama - Mitchell	Line	AP	($19.5)	($21.0)	($0.0)	$1.6	($17.1)	($17.6)	$0.0	$0.5	$2.1	1,883	784
State Line - Wolf Lake	Flowgate	Midwest ISO	($21.4)	($24.2)	($0.1)	$2.7	($27.5)	($26.9)	$0.0	($0.6)	$2.1	1,241	590
Dresden	Transformer	ComEd	$2.7	$0.4	$0.0	$2.3	$2.9	$3.4	($0.0)	($0.5)	$1.8	77	22
South Mahwah - Waldwick	Line	PSEG	$5.9	$6.0	$0.0	($0.1)	$10.6	$12.1	($0.0)	($1.5)	($1.6)	304	58

Table 7-44 ComEd Control Zone top congestion cost impacts (By facility): Calendar year 2006

			Congestion Costs (Millions)									Event Hours	
			Day Ahead				Balancing						
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Kammer	Transformer	500	($146.6)	($148.2)	$4.2	$5.8	($10.1)	($19.9)	($0.2)	$9.6	$15.4	2,043	688
Cloverdale - Lexington	Line	AEP	($70.0)	($74.8)	$1.7	$6.5	($18.9)	($25.9)	($0.0)	$7.0	$13.5	1,517	961
Wylie Ridge	Transformer	AP	($75.1)	($76.7)	$2.5	$4.2	($9.1)	($17.5)	$0.2	$8.6	$12.8	2,286	1,084
Bedington - Black Oak	Interface	500	($164.4)	($164.7)	$3.6	$3.9	($16.3)	($24.8)	($0.0)	$8.5	$12.4	3,875	1,812
Cedar Grove - Roseland	Line	PSEG	($136.0)	($139.2)	$3.7	$6.9	($9.7)	($12.2)	($0.0)	$2.4	$9.3	3,692	541
Branchburg - Readington	Line	PSEG	($46.8)	($46.8)	$0.7	$0.7	($12.2)	($19.0)	($0.0)	$6.8	$7.5	704	480
Kanawha - Matt Funk	Line	AEP	($53.0)	($52.8)	$1.8	$1.6	($4.0)	($9.7)	($0.2)	$5.5	$7.2	2,025	617
Cherry Valley - Belvidere	Line	ComEd	$5.3	($1.0)	$0.0	$6.4	$0.8	$0.9	$0.0	($0.2)	$6.2	39	12
5004/5005 Interface	Interface	500	($144.3)	($145.5)	$3.4	$4.6	($10.7)	($11.4)	($0.0)	$0.8	$5.4	1,738	341
Jefferson - Taylor	Line	ComEd	$23.9	$19.1	($0.2)	$4.6	$1.3	$0.7	$0.0	$0.6	$5.2	137	11
Dresden	Transformer	ComEd	$9.3	$4.5	($0.0)	$4.7	$0.9	$0.5	$0.0	$0.3	$5.1	64	18
West	Interface	500	($78.5)	($78.1)	$1.4	$0.9	($5.1)	($9.1)	($0.0)	$4.0	$4.9	981	328
Oak Park - Ridgeland	Line	ComEd	$12.9	$8.7	($0.0)	$4.1	$0.0	$0.0	$0.0	$0.0	$4.1	338	0
AP South	Interface	500	($42.1)	($42.5)	$1.2	$1.6	($7.4)	($9.5)	($0.0)	$2.1	$3.7	639	237
Northwest - Devon	Line	ComEd	($0.0)	($0.2)	$0.0	$0.2	($5.0)	($1.6)	($0.1)	($3.4)	($3.2)	17	52

DAY Control Zone

Table 7-45 and Table 7-46 show the constraints with the largest impacts on total congestion cost in the DAY Control Zone. In 2007, the Cloverdale — Lexington and Kammer transformer constraints were the largest contributors to positive congestion while the Amos transformer constraint contributed to negative congestion. In 2006, the Kammer transformer and Cedar Grove — Roseland constraints had been the largest contributors to positive congestion while the Avon transformer contributed to negative congestion.

Table 7-45 DAY Control Zone top congestion cost impacts (By facility): Calendar year 2007

			Congestion Costs (Millions)										
			Day Ahead				Balancing					Event Hours	
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Cloverdale - Lexington	Line	AEP	($29.3)	($35.2)	$0.1	$6.0	($30.5)	($30.5)	($0.0)	($0.1)	$6.0	3,704	1,885
Kammer	Transformer	500	($18.8)	($21.6)	($0.0)	$2.8	($20.9)	($19.8)	($0.0)	($1.1)	$1.7	2,005	947
Bedington - Black Oak	Interface	500	($56.8)	($60.3)	($0.1)	$3.3	($48.5)	($46.2)	($0.0)	($2.3)	$1.0	5,493	1,836
Central	Interface	500	($5.7)	($6.6)	$0.0	$0.9	($0.2)	($0.2)	$0.0	($0.0)	$0.9	1,334	25
5004/5005 Interface	Interface	500	($13.0)	($14.3)	($0.0)	$1.3	($6.2)	($5.8)	($0.0)	($0.4)	$0.9	1,512	386
Branchburg - Readington	Line	PSEG	($9.8)	($10.8)	$0.0	$1.0	($13.1)	($12.4)	($0.0)	($0.7)	$0.3	2,324	721
Axton	Transformer	AEP	($1.5)	($1.8)	$0.0	$0.2	$0.0	$0.0	$0.0	$0.0	$0.2	238	0
Wylie Ridge	Transformer	AP	($8.7)	($9.1)	($0.0)	$0.3	($9.7)	($9.5)	$0.0	($0.1)	$0.2	1,486	685
East	Interface	500	($1.5)	($1.7)	$0.0	$0.2	($0.0)	($0.0)	$0.0	($0.0)	$0.2	304	5
AP South	Interface	500	($8.1)	($8.6)	($0.0)	$0.5	($5.8)	($5.4)	($0.0)	($0.3)	$0.2	706	133
Eureka - Willow Island	Line	AP	($0.1)	($0.3)	$0.0	$0.2	($0.1)	($0.1)	($0.0)	($0.0)	$0.2	239	34
Cloverdale	Transformer	AEP	($1.6)	($2.0)	$0.0	$0.4	($2.7)	($2.5)	($0.0)	($0.2)	$0.2	233	152
South Mahwah - Waldwick	Line	PSEG	$0.7	$0.8	($0.0)	($0.1)	$2.4	$2.2	($0.0)	$0.2	$0.1	304	58
Amos	Transformer	AEP	($0.4)	($0.3)	($0.0)	($0.2)	($1.1)	($1.1)	$0.0	$0.0	($0.1)	311	132
Homer City - Shelocta	Line	PENELEC	$0.2	$0.2	($0.0)	$0.0	$0.6	$0.4	$0.0	$0.1	$0.1	200	99

Table 7-46 DAY Control Zone top congestion cost impacts (By facility): Calendar year 2006

			Congestion Costs (Millions)										
			Day Ahead				Balancing					Event Hours	
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Kammer	Transformer	500	($14.4)	($17.9)	($0.3)	$3.2	($10.2)	($9.6)	$0.0	($0.6)	$2.5	2,043	688
Cedar Grove - Roseland	Line	PSEG	($12.5)	($14.8)	$0.1	$2.5	($6.3)	($6.1)	($0.0)	($0.3)	$2.2	3,692	541
Cloverdale - Lexington	Line	AEP	($6.3)	($7.8)	$0.6	$2.1	($12.9)	($12.8)	($0.0)	($0.0)	$2.1	1,517	961
5004/5005 Interface	Interface	500	($13.7)	($14.7)	$1.5	$2.5	($6.5)	($6.1)	$0.0	($0.5)	$2.0	1,738	341
Avon	Transformer	AEP	$0.0	$0.0	$0.0	$0.0	($0.6)	$0.8	($0.0)	($1.4)	($1.4)	0	229
Kanawha - Matt Funk	Line	AEP	($8.2)	($10.1)	($0.1)	$1.8	($7.5)	($6.8)	($0.0)	($0.7)	$1.0	2,025	617
West	Interface	500	($7.4)	($8.9)	($0.2)	$1.4	($5.5)	($5.0)	($0.0)	($0.5)	$0.9	981	328
Marquis - Killen	Line	AEP	($0.2)	($0.8)	$0.3	$0.9	$0.0	$0.0	$0.0	$0.0	$0.9	288	0
Central	Interface	500	($4.7)	($5.0)	$0.5	$0.8	($0.2)	($0.1)	$0.0	($0.0)	$0.8	699	15
Meadow Brook	Transformer	AP	($2.6)	($2.5)	$0.6	$0.4	($0.3)	($0.2)	$0.0	($0.0)	$0.4	726	124
Doubs - Mount Storm	Line	500	($2.7)	($2.7)	$0.4	$0.4	($1.4)	($1.4)	$0.0	$0.0	$0.4	240	50
Cloverdale	Transformer	AEP	($1.1)	($1.3)	$0.1	$0.3	($0.5)	($0.5)	($0.0)	$0.0	$0.3	221	34
East	Interface	500	($1.2)	($1.5)	($0.0)	$0.3	($0.1)	($0.1)	$0.0	($0.0)	$0.3	324	11
AP South	Interface	500	($4.2)	($4.8)	($0.1)	$0.5	($5.6)	($5.3)	$0.0	($0.2)	$0.3	639	237
Axton	Transformer	AEP	($2.7)	($2.8)	$0.1	$0.3	($0.4)	($0.4)	($0.0)	($0.1)	$0.3	218	35

DLCO Control Zone

Table 7-47 and Table 7-48 show the constraints with the largest impacts on total congestion cost in the DLCO Control Zone. In 2007, the Bedington — Black Oak and Beaver — Clinton constraints were the largest contributors to positive congestion while the Elrama — Mitchell and Sammis — Wylie Ridge constraints contributed to negative congestion. In 2006, the Bedington — Black Oak and Cedar Grove — Roseland constraints had been the largest contributors to positive congestion while the Sammis — Wylie Ridge and Elrama — Mitchell constraints contributed to negative congestion.

Table 7-47 DLCO Control Zone top congestion cost impacts (By facility): Calendar year 2007

			Congestion Costs (Millions)									Event Hours	
			Day Ahead				Balancing						
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	($134.5)	($157.7)	($0.1)	$23.2	($70.4)	($58.1)	$0.0	($12.3)	$10.9	5,493	1,836
Beaver - Clinton	Line	DLCO	($0.1)	($6.9)	$0.1	$6.8	$2.5	$2.0	$0.0	$0.5	$7.3	451	43
Elrama - Mitchell	Line	AP	($27.2)	($27.9)	($0.1)	$0.6	($32.7)	($25.9)	$0.1	($6.7)	($6.2)	1,883	784
Carson - Homested	Line	DLCO	$3.4	($1.2)	$0.0	$4.7	$0.0	$0.0	$0.0	($0.0)	$4.6	253	2
Cloverdale - Lexington	Line	AEP	($19.3)	($25.8)	$0.0	$6.6	($12.3)	($10.3)	($0.0)	($2.0)	$4.5	3,704	1,885
Wylie Ridge	Transformer	AP	($29.8)	($38.4)	($0.0)	$8.6	($21.9)	($17.5)	$0.0	($4.4)	$4.2	1,486	685
5004/5005 Interface	Interface	500	($26.8)	($31.7)	($0.0)	$4.9	($8.0)	($6.6)	$0.0	($1.4)	$3.5	1,512	386
Branchburg - Readington	Line	PSEG	($15.0)	($18.3)	($0.0)	$3.3	($11.5)	($10.5)	$0.0	($1.0)	$2.3	2,324	721
Sammis - Wylie Ridge	Line	AP	($1.3)	($2.0)	$0.0	$0.7	($9.1)	($6.2)	$0.0	($2.9)	($2.2)	90	109
Central	Interface	500	($9.3)	($11.4)	($0.0)	$2.1	($0.2)	($0.2)	$0.0	($0.0)	$2.1	1,334	25
Cheswick - Evergreen	Line	DLCO	($0.8)	($3.1)	$0.0	$2.3	$0.0	$0.2	$0.0	($0.2)	$2.1	300	102
Brunot Island - Montour	Line	DLCO	$2.1	($0.1)	$0.0	$2.2	$3.1	$3.4	($0.0)	($0.3)	$1.9	88	42
Crescent - Neville Tap	Line	DLCO	$0.9	($0.8)	$0.0	$1.7	$1.0	$0.9	($0.0)	$0.1	$1.8	100	44
Kammer	Transformer	500	($4.6)	($6.9)	$0.0	$2.3	($3.7)	($3.2)	($0.0)	($0.6)	$1.7	2,005	947
Unclassified	Unclassified	Unclassified	$1.6	$0.1	$0.0	$1.5	$0.0	$0.0	$0.0	$0.0	$1.5	NA	NA

Table 7-48 DLCO Control Zone top congestion cost impacts (By facility): Calendar year 2006

			Congestion Costs (Millions)										
			Day Ahead				Balancing					Event Hours	
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	($56.7)	($65.4)	$1.6	$10.3	($33.4)	($28.2)	$0.1	($5.1)	$5.2	3,875	1,812
Cedar Grove - Roseland	Line	PSEG	($17.1)	($21.2)	$1.0	$5.0	($6.0)	($5.2)	$0.0	($0.9)	$4.1	3,692	541
Wylie Ridge	Transformer	AP	($22.9)	($29.1)	$2.2	$8.4	($23.9)	($18.9)	$0.0	($4.9)	$3.4	2,286	1,084
5004/5005 Interface	Interface	500	($25.3)	($28.5)	$0.3	$3.5	($8.0)	($7.5)	$0.0	($0.5)	$3.1	1,738	341
West	Interface	500	($12.0)	($15.1)	$0.3	$3.4	($6.0)	($5.1)	$0.0	($0.9)	$2.5	981	328
Mount Storm - Pruntytown	Line	AP	($12.9)	($15.2)	$0.2	$2.5	($6.5)	($5.8)	$0.0	($0.7)	$1.8	891	465
Kammer	Transformer	500	($3.6)	($5.1)	$0.3	$1.8	($1.4)	($1.1)	($0.0)	($0.3)	$1.5	2,043	688
Sammis - Wylie Ridge	Line	AP	$0.0	$0.0	$0.0	$0.0	($5.2)	($3.9)	$0.0	($1.3)	($1.3)	0	125
Cheswick - Evergreen	Line	DLCO	($0.1)	($1.3)	$0.0	$1.2	$0.1	$0.1	$0.0	($0.0)	$1.2	167	45
Crescent	Transformer	DLCO	$0.0	$0.0	$0.0	$0.0	$7.8	$6.8	($0.0)	$0.9	$0.9	0	23
Central	Interface	500	($7.1)	($8.0)	$0.1	$0.9	($0.1)	($0.1)	$0.0	($0.0)	$0.9	699	15
Elrama	Transformer	AP	($0.9)	($1.8)	$0.0	$0.9	($0.0)	($0.0)	$0.0	($0.0)	$0.9	927	34
Kanawha - Matt Funk	Line	AEP	($3.1)	($4.0)	$0.3	$1.2	($2.2)	($1.8)	($0.0)	($0.4)	$0.9	2,025	617
Elrama - Mitchell	Line	AP	($5.4)	($6.0)	$0.5	$1.2	($7.9)	($6.0)	$0.0	($1.9)	($0.8)	654	258
Branchburg - Readington	Line	PSEG	($5.9)	($7.3)	$0.2	$1.7	($8.7)	($7.7)	$0.0	($1.0)	$0.7	704	480

Southern Region Congestion-Event Summaries

Dominion Control Zone

Table 7-49 and Table 7-50 show the constraints with the largest impacts on total congestion cost in the Dominion Control Zone. In 2007, the Bedington — Black Oak and Cloverdale — Lexington constraints were the largest contributors to positive congestion while the Branchburg — Readington and Central interface constraints contributed to negative congestion. In 2006, the Bedington — Black Oak and AP South interface constraints had been the largest contributors to positive congestion while the Cedar Grove — Roseland constraint contributed to negative congestion.

Table 7-49 Dominion Control Zone top congestion cost impacts (By facility): Calendar year 2007

			Congestion Costs (Millions)										
			Day Ahead				Balancing					Event Hours	
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$587.7	$503.2	$11.1	$95.6	$567.3	$556.0	($8.0)	$3.4	$99.0	5,493	1,836
Cloverdale - Lexington	Line	AEP	$242.7	$160.3	$10.9	$93.3	$346.0	$345.6	($7.3)	($6.8)	$86.4	3,704	1,885
AP South	Interface	500	$43.6	$8.7	$0.4	$35.2	$31.7	$29.7	$0.4	$2.3	$37.5	706	133
Meadow Brook	Transformer	AP	($6.7)	($16.0)	($0.2)	$9.0	($1.1)	($1.2)	$0.0	$0.2	$9.2	868	233
Kammer	Transformer	500	$45.7	$40.4	$1.6	$6.8	$58.3	$56.9	($1.2)	$0.3	$7.1	2,005	947
Bedington	Transformer	AP	$22.7	$16.9	$0.5	$6.3	$24.3	$23.3	($0.4)	$0.6	$6.9	928	429
Branchburg - Readington	Line	PSEG	($70.1)	($63.8)	($0.3)	($6.5)	($83.5)	($82.8)	$0.6	($0.0)	($6.6)	2,324	721
5004/5005 Interface	Interface	500	($16.6)	($21.7)	$0.4	$5.4	($9.6)	($9.4)	$0.2	$0.1	$5.5	1,512	386
Central	Interface	500	($32.5)	($28.3)	($0.2)	($4.4)	($1.0)	($1.0)	$0.0	($0.0)	($4.4)	1,334	25
Cloverdale	Transformer	AEP	$11.2	$7.7	$0.4	$3.9	$20.4	$19.6	($0.4)	$0.4	$4.3	233	152
Wylie Ridge	Transformer	AP	$16.3	$12.9	$0.8	$4.3	$19.8	$19.6	($0.3)	($0.1)	$4.2	1,486	685
Halifax - Clover	Line	Dominion	($2.3)	($6.4)	($0.0)	$4.0	$0.0	$0.0	$0.0	$0.0	$4.0	130	5
Ox	Transformer	Dominion	$2.1	($2.0)	($0.0)	$4.1	$5.7	$5.8	$0.0	($0.1)	$4.0	39	43
Aqueduct - Doubs	Line	AP	$5.0	$1.7	$0.1	$3.4	$2.0	$1.9	($0.0)	$0.1	$3.5	262	21
Doubs	Transformer	AP	$2.3	($1.1)	($0.0)	$3.3	($0.0)	$0.0	$0.0	$0.0	$3.3	135	99

Table 7-50 Dominion Control Zone top congestion cost impacts (By facility): Calendar year 2006

			Congestion Costs (Millions)										
			Day Ahead				Balancing					Event Hours	
Constraint	Type	Location	Load Payments	Generation Credits	Explicit	Total	Load Payments	Generation Credits	Explicit	Total	Grand Total	Day Ahead	Real Time
Bedington - Black Oak	Interface	500	$545.2	$481.7	$7.0	$70.4	$511.9	$515.5	($2.4)	($6.0)	$64.5	3,875	1,812
AP South	Interface	500	$46.3	$18.4	$0.1	$28.0	$79.6	$77.5	($0.6)	$1.6	$29.5	639	237
Cloverdale - Lexington	Line	AEP	$70.8	$37.5	$1.9	$35.3	$188.3	$191.1	($5.0)	($7.8)	$27.5	1,517	961
Doubs - Mount Storm	Line	500	$17.3	$2.2	$0.1	$15.2	$11.4	$11.5	($0.3)	($0.4)	$14.8	240	50
Cedar Grove - Roseland	Line	PSEG	($74.2)	($63.1)	($0.4)	($11.5)	($39.8)	($38.3)	($0.0)	($1.5)	($13.0)	3,692	541
Meadow Brook	Transformer	AP	($9.3)	($23.1)	($0.7)	$13.2	$0.5	$0.8	$0.1	($0.2)	$13.0	726	124
Kanawha - Matt Funk	Line	AEP	$105.7	$87.2	$1.0	$19.5	$100.1	$108.3	($1.7)	($9.8)	$9.7	2,025	617
Aqueduct - Doubs	Line	AP	$17.9	$9.1	$0.4	$9.2	$13.7	$13.1	($0.2)	$0.5	$9.7	362	127
Dooms	Transformer	Dominion	$17.0	$7.9	$0.7	$9.9	$46.3	$44.9	($2.0)	($0.6)	$9.3	150	147
Doubs	Transformer	AP	$1.0	($5.8)	$0.0	$6.8	$1.5	$1.4	$0.1	$0.1	$6.9	90	74
5004/5005 Interface	Interface	500	($22.7)	($27.3)	$0.0	$4.5	($10.0)	($10.9)	($0.0)	$0.9	$5.4	1,738	341
Kammer	Transformer	500	$46.8	$39.3	$0.6	$8.1	$30.6	$33.0	($0.4)	($2.9)	$5.2	2,043	688
Mount Storm - Pruntytown	Line	AP	$141.4	$136.4	$1.5	$6.5	$118.3	$118.5	($1.2)	($1.4)	$5.1	891	465
Cloverdale	Transformer	AEP	$12.6	$7.3	$0.2	$5.6	$6.5	$6.9	($0.1)	($0.5)	$5.0	221	34
Dayton - Harrisonburg	Line	Dominion	$5.6	$1.2	$0.2	$4.6	$0.0	$0.0	$0.0	$0.0	$4.6	74	0

Economic Planning Process

Transmission system investments can be evaluated on a reliability basis or on an economic basis. The reliability evaluation examines whether a transmission upgrade is required in order to maintain reliability on the system in a particular area or areas, using specific planning and reliability criteria.[15] The economic evaluation examines whether a transmission upgrade, including reliability upgrades, results in positive economic benefits. The economic evaluation is more complex because there is more judgment involved in the choice of relevant metrics for both benefits and costs. PJM's responsibility as an RTO requires PJM to constantly evaluate the need for transmission investments related to reliability and to help ensure that the responsible transmission owner constructs needed facilities. As the operator and designer of markets, PJM also needs to consider the appropriate role for the economic evaluation of transmission system investments.

15 See PJM. "Amended And Restated Operating Agreement of PJM Interconnection, L.L.C." (December 7, 2007) (Accessed February 27, 2008), Schedule 6 < http://www.pjm.com/documents/downloads/agreements/oa.pdf > (1,123 KB).

Investments in transmission are currently compensated under the FERC's traditional rate base – rate of return regulatory approach. While PJM's Tariff permits merchant projects, the significant merchant transmission projects have been direct current (DC) tie lines to export power rather than investments in network facilities. As a general matter, transmission investments have not been fully incorporated into competitive markets. The construction of new transmission facilities can have significant impacts on energy markets, but there is no market mechanism in place that would permit competition between transmission and generation to meet loads in an area. While it does not address the issue of permitting competition between transmission and generation projects, the first step toward integrating transmission investments into the market has been the use of economic evaluation metrics to determine whether there are positive economic benefits associated with an investment in transmission that might warrant the investment even when it was not required for reliability.

PJM has made multiple filings related to economic metrics for evaluating transmission investments.[16] The FERC has required that PJM use an approach with predefined formulas for determining whether a defined transmission investment passes the cost-benefit test including explicit accounting for changes in production costs, the costs of complying with environmental regulations, generation availability trends and demand-response trends.[17]

On October 9, 2007, PJM submitted its compliance filing to address these issues and to provide a formulaic approach for including transmission projects in the RTEP.[18]

Under PJM's proposed approach, PJM would perform market simulations with and without the proposed transmission investments including reliability-based investments and economic investments. The result would be used to determine the economic benefits of the investments and whether to include such investment in the RTEP. An economic investment would be included in the RTEP, if the relative benefits and costs of the investment meet a benefit/cost ratio (Equation 7-1) threshold of at least 1.25:1:[19]

Equation 7-1 Proposed benefit/cost ratio

benefit / cost ratio =
[total annual enhancement benefit] ÷ [total enhancement cost] .

The benefit component of the benefit/cost ratio is the total annual enhancement benefit which is the sum of two metrics: the *Energy Market benefit* and the *Reliability Pricing Model* benefit. The Energy Market benefit and the Reliability Pricing Model benefit are defined in Equation 7-2 and Equation 7-3, respectively:

Equation 7-2 Energy Market benefit

Energy Market benefit =
[0.70] • [change in total energy production cost] + [0.30] • [change in load energy payment]; and

16 *PJM Interconnection, L.L.C.*, PJM Interconnection, L.L.C. submitted modifications to its Regional Transmission Expansion Planning Protocol, Docket No. ER06-1474-000 (September 8, 2006). PJM Interconnection, L.L.C. submitted its compliance filing providing additional information and amendments to its Regional Transmission Expansion Planning Protocol, Docket No. ER06-1474-003 (March 21, 2007).

17 119 FERC ¶ 61,265 (2007).

18 PJM Interconnection, L.L.C. submitted its compliance filing, Docket No. ER06-1474-000 (October 9, 2007). As of December 31, 2007, the FERC had not issued an order in response to this October compliance filing.

19 The enhancement benefits and costs appearing in Equation 7-1 are determined as the present value of the annual total for each of the first 15 years of the life of the enhancement or expansion.

Equation 7-3 Reliability Pricing Model benefit

Reliability Pricing Model benefit =
[0.70] • [change in total system capacity cost] + [0.30] • [change in load capacity payment].

The Energy Market benefit measures benefits as the weighted sum of changes in energy production cost and load energy payment.[20, 21] The Reliability Pricing Model benefit measures benefits as the weighted sum of changes in total system capacity cost and in load capacity payment. [22, 23] The change in production costs is the total resource saving associated with a transmission investment. The change in load payments for energy is a direct measure of the net load savings associated with the investment.

The cost component of the benefit/cost ratio (total enhancement cost) in Equation 7-1 is expressed in Equation 7-4 as the present value of the revenue requirement of the transmission investment:

Equation 7-4 Total enhancement cost

total enhancement cost =
the estimated annual revenue requirement for the economic-based enhancement or expansion.

PJM's RTEP is a planning process that integrates transmission, generation and demand-side resources to address transmission system constraints that affect reliability and system economics.[24]

The proposed revisions to the economic planning process incorporate improvements over the existing process but require continued development. The most significant improvements are the inclusion of less discretionary metrics and the evaluation of demand-side response and generation resources as alternatives to transmission investment. New transmission projects, and the lack of existing transmission, can have significant impacts on PJM markets. The goal of transmission planning should ultimately be the incorporation of transmission investment decisions into market-driven processes as much as is practicable.

20 The change in total energy production cost = the difference in the following between the case with the investment and without the investment: [the estimated total annual fuel costs, variable O&M costs, and emissions costs of the dispatched resources].

21 The change in load energy payment = the difference in the following between the case with the investment and without the investment: [annual sum of (hourly estimated zonal load MW for each zone) • (hourly estimated zonal LMP for each zone)] – [annual sum of (hourly estimated zonal load MW for each zone) • (hourly estimated zonal LMP for each zone)]. For economic-based enhancements and expansions for which cost responsibility is assigned pursuant to section (b)(i) of Schedule 12 of the PJM Tariff, the change in the load energy payment is determined as the sum of the change in load energy payment in all zones. For economic-based enhancements or expansions for which cost responsibility is assigned pursuant to section (b)(v) of Schedule 12 of the PJM Tariff, the change in load energy payment is determined as the sum of the change in the load energy payment only of the zones that show a decrease in load energy payment.

22 The change in total system capacity cost = the difference in the following between the case with the investment and without the investment: [the sum of (the MW that are estimated to be cleared in the base residual auction under Attachment DD of the PJM Tariff) • (the prices that are estimated to be contained in the sell offers for each such cleared MW) • (the number of days in the study year)].

23 The change in load capacity payment = the difference in the following between the case with the investment and without the investment: [the sum of (the estimated zonal load MW in each zone) • (the estimated final zonal Capacity Market prices under Attachment DD of the PJM Tariff) • (the number of days in the study year)]. For economic-based enhancements and expansions for which cost responsibility is assigned pursuant to section (b)(i) of Schedule 12 of the PJM Tariff, the change in the load capacity payment is determined as the sum of the change in load capacity payment in all zones. For economic-based enhancements or expansions for which cost responsibility is assigned pursuant to section (b)(v) of Schedule 12 of the PJM Tariff, the change in load Capacity Market payment is determined as the sum of the change in the load Capacity Market payment only of the zones that show a decrease in load Capacity Market payment.

24 See "Regional Transmission Expansion Plan Executive Summary" (February 27, 2007) (Accessed January 24, 2008) < http://www2.pjm.com/planning/downloads/20070301-section-01.pdf> (3MB).