SECTION 7 – CONGESTION

Congestion occurs when available, lower-cost energy cannot be delivered to all loads for a period because transmission capabilities are not adequate to meet some loads for the period. When the least cost available energy cannot be delivered to load in a transmission-constrained area, higher cost units in this 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 of pricing energy supply 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 a negative nor a positive but is a direct measure of the extent to which there are differences in the cost of generation that cannot be equalized through the capability of the transmission system to deliver the cheapest energy to all parts of the system in every hour. A rational planning process would attempt to choose the least cost combination of transmission and generation and would reflect the fact that investments in both transmission and generation have costs. The transmission system provides one 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, FTRs are not a complete hedge against congestion, FTRs do provide a substantial offset to the cost of congestion to firm load.

As PJM integrated new transmission zones during 2005, the patterns of congestion changed, reflecting additional transmission and generation resources with new cost structures, load requirements and transmission system characteristics.

During the last two calendar years, PJM has integrated five control zones. In the *2004 State of the Market Report* the calendar year was divided into three phases, corresponding to market integration dates. In the *2005 State of the Market Report* the calendar year is divided into two phases, also corresponding to market integration dates:[2]

- **Phase 1 (2004).** The four-month period from January 1 through April 30, 2004, during which PJM was comprised of the Mid-Atlantic Region, including its 11 zones,[3] and the Allegheny Power Company (AP) Control Zone.[4]

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

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

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

- **Phase 2 (2004).** The five-month period from May 1 through September 30, 2004, during which PJM was comprised of the Mid-Atlantic Region, including its 11 zones, the AP Control Zone and the Commonwealth Edison Company Control Area (ComEd).[5]

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

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

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

Overview

Congestion Cost

- **Total Congestion.** Congestion costs have ranged from 6 percent to 10 percent of PJM annual total billings since 2000. Congestion costs were approximately 9 percent of total PJM billings for 2005, as they were in 2004. Total congestion costs were $2.09 billion in calendar year 2005, a 179 percent increase from $750 million in calendar year 2004. The increased size of the total PJM Energy Market contributed to the increase in total congestion charges. The total PJM billing for 2005 was $22.63 billion, a 160 percent increase over the approximately $8.70 billion billed in 2004.

- **Monthly Congestion.** Differences in monthly congestion costs continued to be substantial. In 2005, these differences were driven by varying load and energy import levels, different patterns of generation, weather-induced changes in demand and variations in congestion frequency on constraints affecting large portions of PJM load.

- **Hedged Congestion.** FTRs were paid at 100 percent of the target allocation level for the 12-month planning period that ended May 31, 2005. FTRs were paid at 91 percent of the target allocation level through December 31, 2005, of the planning period ending May 31, 2006.

LMP Differentials and Facility or Zonal Congestion

- **LMP Differentials.** To provide an approximate indication of the geographic dispersion of congestion costs, LMP differentials were calculated for control zones in the PJM Mid-Atlantic and Western Regions as they existed at year end.

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

- **Congested Facilities.** Congestion frequency increased in calendar year 2005 as compared to 2004. During 2005, there were 17,524 congestion-event hours as compared to 11,205 congestion-event hours in 2004. Interfaces, transformers and lines experienced overall increases in congested hours during 2005 as compared to 2004. The expansion of PJM through the integration of new control zones contributed to the increase in congestion frequency.

- **Zonal Congestion.** In calendar year 2005, the AP Control Zone experienced the largest increase in congestion frequency of any control zone in PJM. The 2,877 congestion-event hours in the AP Control Zone were a 746 percent increase over the 340 congestion-event hours the zone had experienced during 2004. The Doubs transformer and the Mount Storm-Pruntytown line together contributed 1,222 congestion-event hours or 42 percent of the AP Control Zone total. In the AECO Control Zone, there was a 119 percent increase in congestion on the Laurel-Woodstown 69 kV line. With 879 congestion-event hours, the Laurel-Woodstown line comprised 50 percent of all AECO Control Zone congestion during 2005. The AEP Control Zone saw increases in congestion on the Cloverdale-Lexington, Mahans Lane-Tidd and Kanawha-Matt Funk lines during 2005. These three facilities accounted for 1,357 congestion-event hours, or 71 percent of the total AEP Control Zone congestion during 2005. Congestion on 500 kV zone facilities increased in 2005 as compared to 2004, contributing 5,548 congestion-event hours or 32 percent of the total PJM congestion-event hours. Three 500 kV zone facilities, the Wylie Ridge transformer, Kammer transformer and the Bedington-Black Oak line contributed 4,045 congestion-event hours or 73 percent of all 500 kV zone congestion-event hours during 2005. The Wylie Ridge transformer, the Kammer transformer and the Bedington-Black Oak line were the first, second and third most frequently constrained facilities, respectively, during 2005.

Post-Contingency Congestion Management Program

- **Implementation.** PJM implemented a post-contingency congestion management protocol on September 1, 2004, under which a transmission facility may be operated to a 30-minute, short-term emergency rating if there is sufficient quick start generation capability or switching to respond to the loss of a facility.

- **Initial Results.** Beginning on June 1, 2005, there were 36 facilities included in this program, an increase of 21 facilities over the number as of June 1, 2004. During 2005, 136 hours of off-cost operation were avoided through the use of this protocol.

Economic Planning Process

- **Implementation.** PJM's regional transmission expansion planning (RTEP) process includes an economic planning component to identify the transmission upgrades needed to address unhedgeable congestion whether through a market window or directly through the RTEP process. However, the current methodology for calculating unhedgeable congestion overstates the value of economic generation as a congestion hedge unless economic local generation is owned by load. The result of such an overstatement is to undervalue the cost of unhedgeable congestion and to undervalue transmission upgrades. This, in turn, would lead to the rejection of cost-effective economic transmission upgrades under the cost-benefit calculation.

- **Early Results.** By December 31, 2005, 74 facilities had experienced sufficient levels of unhedgeable congestion to trigger the opening of a market window to solicit merchant solutions to relieve congestion. Of these, 31 or approximately 42 percent had completed their initial studies.

Conclusion

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 increased in 2005 in approximate proportion to the total increase in total billing as PJM continued to expand its footprint. The year 2005 was the first full calendar year reflecting the impact of areas integrated in 2004 in addition to the phased 2005 integrations of the DLCO and Dominion Control Zones. This constituted a dramatic change in the nature of the power system managed by PJM, including large new areas under LMP-based redispatch where borders had previously been managed by transmission loading relief (TLR) procedures and ramp limits. Efficient redispatch displaced the less efficient management of borders. That redispatch was more efficient and, at the same time, revealed the underlying limitations of the ability of the transmission system over the broad footprint 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 for the first time, is an essential input to a rational market and planning process that covers the entire expanded footprint for the first time. PJM has made significant steps in the transmission planning process and needs to make more, in particular ensuring that the calculation of the costs and benefits of congestion is done appropriately. With all the changes, ARRs and FTRs continued to serve as a hedge against congestion. FTRs were paid at 100 percent of their target allocation for the planning year ended May 31, 2005, and at 91 percent for the first seven months of the current planning year.

Congestion

Congestion Accounting

Transmission congestion can exist in PJM's Day-Ahead and Real-Time Energy Markets. Transmission congestion charges in the Day-Ahead Energy Market can be directly hedged by FTRs. Real-time 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.

Total congestion charges are the sum of the implicit and explicit day-ahead and balancing congestion charges, plus the day-ahead and balancing congestion charges implicitly paid in the Spot Market, minus any negatively valued FTR target allocations.[6]

- **Implicit Congestion Charges.** These charges are incurred by network service customers in delivering their generation to their load and equal the difference between a participant's load charges and generation credits, less the participant's Spot Market bill. In the Day-Ahead Energy Market, load charges are calculated as the sum of the demand at every bus times the bus LMP. Demand includes load, decrement bids and sale transactions. Generation credits are similarly calculated as the sum of

6 See PJM manual, "Operating Agreement Accounting (m28), Revision 31" (November 1, 2005) p. 57.

the supply at every bus times the bus LMP, where supply includes generation, increment bids and purchase transactions. In the Real-Time Energy Market, load charges and generation credits are calculated the same way, using the differences between day-ahead and real-time demand and supply and valuing congestion using real-time LMP.

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

- **Spot Market Congestion Charges.** These charges are equal to the difference between total Spot Market purchase payments and total Spot Market sales revenues.

Total Calendar Year Congestion

Previously, state of the market reports have shown FTR revenues as congestion charges. While congestion charges are the primary source of funding to meet FTR target allocations, they are only a part of total FTR funding. Here, congestion charges and FTR revenues are reported separately. Annual congestion charges may be greater than, less than, or equal to, total FTR revenues depending upon adjustments made to total FTR revenues. A year-to–year comparison of congestion charges and total FTR revenues shows that congestion charges were greater than FTR revenues in 1999 and 2002, equal in 2000 and 2001, and less than FTR revenues in 2003 through 2005. (See Table 7-1 and Table 7-2.) Table 7-3 shows the detail for calendar year 2005 of the components of FTR revenues including congestion charges and other adjustments.

Table 7-1 shows that FTR revenues have ranged from 6 percent to 9 percent of total annual PJM billings since 2000.[7] Though FTR revenues increased by 166 percent in 2005 as compared to 2004, they remained at approximately 9 percent of total PJM billings in 2005. The total PJM billing for 2005 was $22.63 billion, a 160 percent increase over the $8.7 billion billed in 2004.

Table 7-1 - Total annual PJM FTR revenues [Dollars (millions)]: Calendar years 1999 to 2005

	FTR Revenues	Percent Increase	Total PJM Billing	Percent of PJM Billing
1999	$53	NA	NA	NA
2000	$132	149%	$2,300	6%
2001	$271	105%	$3,400	8%
2002	$430	59%	$4,700	9%
2003	$499	16%	$6,900	7%
2004	$808	62%	$8,700	9%
2005	$2,146	166%	$22,630	9%
Total	$4,286		$48,630	9%

7 Total FTR revenues calculation in Table 7-1 excludes calendar year 1999.

Congestion charges are comprised of hourly congestion revenue and net negative congestion. Congestion costs have ranged from 6 percent to 10 percent of annual total PJM billings since 2000.[8] Though congestion costs increased by 179 percent in 2005 as compared to 2004, they remained at approximately 9 percent of total PJM billings in 2005 as they were during 2004. Table 7-2 shows total congestion by year from 1999 through 2005. Total congestion costs were $2.092 billion in calendar year 2005, a 179 percent increase from $750 million in calendar year 2004. The total PJM billing for 2005 was $22.63 billion, a 160 percent increase over the $8.7 billion billed in 2004.

Table 7-2 - Total annual PJM congestion [Dollars (millions)]: Calendar years 1999 to 2005

	Congestion Charges	Percent Increase	Total PJM Billing	Percent of PJM Billing
1999	$65	NA	NA	NA
2000	$132	103%	$2,300	6%
2001	$271	106%	$3,400	8%
2002	$453	67%	$4,700	10%
2003	$464	2%	$6,900	7%
2004	$750	62%	$8,700	9%
2005	$2,092	179%	$22,630	9%
Total	$4,163		$48,630	9%

Table 7-3 shows the composition of FTR target allocations and FTR revenues for calendar year 2005.[9] FTR targets are composed of FTR target allocations and associated adjustments. Other adjustments may be made for items such as modeling changes or errors.

FTR revenues are primarily comprised of hourly congestion revenue and net negative congestion. FTR revenues also include ARR excess which is the difference between ARR target allocations and FTR auction revenues. Competing uses, another component of FTR revenues, arise from the Unscheduled Transmission Service Agreement between the New York Independent System Operator (NYISO) and PJM. This agreement sets forth the terms and conditions under which compensation is provided for the provision of transmission service in connection with transactions not scheduled directly or otherwise prearranged between them. During 2005, competing uses accounted for a transfer of $1.8 million from NYISO to PJM. Total congestion charges appearing in Table 7-2 include both congestion associated with PJM facilities and that associated with reciprocal, coordinated flowgates in the Midwest ISO whose operating limits are respected by PJM. The Joint Operating Agreement (JOA) between the Midwest Independent Transmission System Operator, Inc. (Midwest ISO) and PJM sets forth conditions under which congestion charges associated with these reciprocal, coordinated flowgates are reimbursed through payments between the two transmission operators.[10] These payments, which began in April 2005, resulted in a net transfer of $21.6 million to Midwest ISO during calendar year 2005. The operating protocol governing the wheeling contracts between PSEG and Consolidated Edison resulted in a reimbursement of $2.1 million in congestion charges to Consolidated Edison during calendar year 2005, with payments beginning during July.[11] The congestion

8 The total congestion charges calculation in Table 7-2 excludes calendar year 1999.

9 Values in Table 7-3 are calculated using underlying data and may, therefore, not sum precisely as shown.

10 See the Joint Operating Agreement between the Midwest ISO and PJM, Substitute Original Sheet No. 66 <http://www.pjm.com/documents/downloads/agreements/joa-complete.pdf> (2.8 MB).

11 111 FERC ¶ 61,228 (2005).

payouts associated with both the PJM and Midwest ISO Joint Operating Agreement and the operating protocol governing the wheeling contracts between PSEG and Consolidated Edison served to decrease the revenues available to fund the FTR target allocations by $23.7 million during 2005.

Table 7-3 - Total annual PJM FTR revenue detail: Calendar year 2005

ARR Information		Total
ARR Target Allocations	$	653,148,924
FTR Auction Revenue	$	685,870,922
ARR Excess	$	32,721,999
FTR Targets		
FTR Target Allocations	$	2,247,880,993
Adjustments:		
Adjustments to FTR Target Allocations	$	(427,827)
Total FTR Targets	$	2,247,453,166
FTR Revenues		
ARR Excess	$	32,721,999
Competing Uses	$	1,806,387
Net Negative Congestion (Enter as Negative)	$	(10,420,565)
Hourly Congestion Revenue	$	2,101,960,789
Midwest ISO M2M (Credit to PJM Minus Credit to Midwest ISO)	$	(21,634,226)
CEPSW Wheel Congestion Credit (Hourly) (Enter as Negative)	$	(2,110,021)
Adjustments:		
Excess Revenues Carried Forward Into Future Months	$	45,891,816
Excess Revenues Distributed Back to Previous Months	$	-
Other Adjustments to FTR Revenues	$	(1,750,878)
Total FTR Revenues	$	2,146,465,301
Excess Revenues Distributed to Other Months	$	(64,795,613)
Excess Revenues Manually Distributed to Firm Demand Holders	$	(8,987,886)
Total FTR Congestion Credits	$	2,072,681,802
Total Congestion Credits on Bill (Includes CEPSW & End-of-Year Distribution)	$	2,083,781,395
Remaining Deficiency	$	174,771,365

Monthly Congestion

Table 7-4 shows monthly congestion charge variations by year.[12] During calendar year 2005, monthly congestion charges ranged from a maximum of $334 million in August 2005 to a minimum of $57 million in March 2005.

Table 7-4 - Monthly PJM congestion revenue statistics [Dollars (millions)]: Calendar years 2004 and 2005

	Maximum	Mean	Median	Minimum	Range
2004	$154	$63	$55	$18	$135
2005	$334	$174	$161	$57	$277

Approximately 22 percent of all calendar year 2005 congestion occurred during the summer and winter high-demand months of July and January.

Hedged Congestion

Table 7-5 lists FTR Revenues, FTR target allocations and credits, payout ratios, and congestion credit deficiencies and excess congestion charges by month.[13] At the end of the 12-month planning period, excess congestion charges are used to offset any monthly congestion credit deficiencies. PJM is currently in a 12-month planning period that began on June 1, 2005, and will end on May 31, 2006.

12 Values in Table 7-4 are calculated using underlying data and may, therefore, not sum precisely as shown.
13 Values in Table 7-5 are calculated using underlying data and may, therefore, not sum precisely as shown.

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

		FTR Revenues	FTR Target Allocations	FTR Credits	FTR Payout Ratio	Credits Deficiency	Credits Excess
Planning Year 2004 to 2005	Jun-04	$67	$67	$67	100%	$0	$0
	Jul-04	$116	$114	$114	100%	$0	$1
	Aug-04	$128	$128	$128	100%	$0	$0
	Sep-04	$47	$47	$47	100%	$0	$0
	Oct-04	$46	$39	$39	100%	$0	$7
	Nov-04	$81	$81	$81	100%	$0	$0
	Dec-04	$159	$150	$150	100%	$0	$8
	Jan-05	$144	$118	$118	100%	$0	$26
	Feb-05	$80	$65	$65	100%	$0	$15
	Mar-05	$75	$59	$59	100%	$0	$16
	Apr-05	$88	$80	$80	100%	$0	$8
	May-05	$88	$79	$79	100%	$0	$9
	Total	$1,118	$1,028	$1,028	100%	$0	$91
	Values After Excess Revenues Distributed						
		$1,118	$1,028	$1,028	100%	$0	$91
Planning Year 2005 to 2006 (through December 31, 2005)	Jun-05	$180	$187	$180	97%	$7	$0
	Jul-05	$319	$326	$319	98%	$7	$0
	Aug-05	$335	$336	$335	99%	$2	$0
	Sep-05	$224	$259	$224	86%	$35	$0
	Oct-05	$224	$280	$224	80%	$57	$0
	Nov-05	$108	$143	$108	75%	$35	$0
	Dec-05	$282	$315	$282	90%	$33	$0
	Total	$1,672	$1,847	$1,672	91%	$175	$0

FTRs were paid at 100 percent of the target allocation level for the 12-month planning period that ended May 31, 2005. FTRs through December 31, 2005, of the planning period ending May 31, 2006, have been paid at 91 percent of the target allocation level to date.

Although aggregate FTRs provided a hedge against 100 percent of the target allocation level during the 12-month period that ended May 31, 2005, all those paying congestion charges were not necessarily hedged at that level. Aggregate numbers do not reveal the underlying distribution of FTR holders, their revenues or those paying congestion.

LMP Differentials

Constraints were examined by zone and categorized by their effect on regions as well as subareas. Zones correspond to regulated utility franchise areas. Regions generally comprise two or more zones, and subareas consist of portions of one or more zones. At the end of 2005, PJM was comprised of three regions composed of the PJM Mid-Atlantic Region with 11 control zones, the PJM Western Region with five control zones: the AP, ComEd, AEP, DLCO and DAY Control Zones and the Southern Region with the Dominion Control Zone.

LMP differentials were calculated for each PJM control zone to provide an approximate indication of the geographic dispersion of congestion costs. LMP differentials for control zones are presented in Figure 7-1 for calendar years 2002 through 2005, and were calculated as the difference between zonal LMP and the Western Hub LMP.

Figure 7-1 shows overall congestion patterns in 2005. Price separation between eastern and western zones in PJM was driven by congestion on the Bedington-Black Oak line and the Kammer and Wylie Ridge transformers. These constraints generally had the effect of increasing prices in eastern zones located on the constrained side of the affected facilities while reducing prices in the unconstrained western zones. The Bedington-Black Oak constraint had the effect of increasing prices in all but the PENELEC, ComEd, AEP, DAY and DLCO Control Zones where it reduced prices. The Wylie Ridge transformer constraint had the effect of increasing prices in all but the ComEd, AEP, DAY and DLCO Control Zones where it reduced prices. The Kammer transformer constraint had the effect of increasing prices in all but the ComEd, AEP and DAY Control Zones where it reduced prices.

The Cedar Grove-Roseland constraint had the effect of decreasing prices in control zones located on the unconstrained side of this facility. Owing to the location of Cedar Grove-Roseland in the far eastern portion of PJM, prices in all control zones with the exception of the PSEG Control Zone decreased during this constraint.

The DLCO Control Zone exhibited an average negative price differential relative to the Western Hub of approximately $17 per MWh. The Wylie Ridge transformer and Bedington-Black Oak constraints caused the greatest decrease in prices in the DLCO Control Zone. The Dominion Control Zone, during the eight months from its May 1, 2005, integration until the end of the calendar year, exhibited an average differential of approximately $4 per MWh. The Bedington-Black Oak and Mount Storm-Pruntytown constraints caused the greatest increase in prices in the Dominion Control Zone relative to the Western Hub. The AEP and DAY Control Zones, which were integrated during Phase 3, continued to exhibit lower prices than the PJM Western Hub. The AEP and DAY Control Zones exhibited an average differential of approximately $13 per MWh and $15 per MWh, respectively, relative to the PJM Western Hub during 2005. The Kammer and Wylie Ridge transformer constraints caused the greatest decrease in prices in the AEP and DAY Control Zones relative to the Western Hub.

The BGE and PEPCO Control Zones exhibited an average differential of approximately $6 per MWh and $8 per MWh, respectively, relative to the PJM Western Hub during 2005. The Bedington-Black Oak constraint caused the greatest increase in prices in the BGE and PEPCO Control Zones relative to the Western Hub.

Figure 7-1 - Annual average zonal LMP differences (Reference to Western Hub): Calendar years 2002 to 2005

Congested Facilities

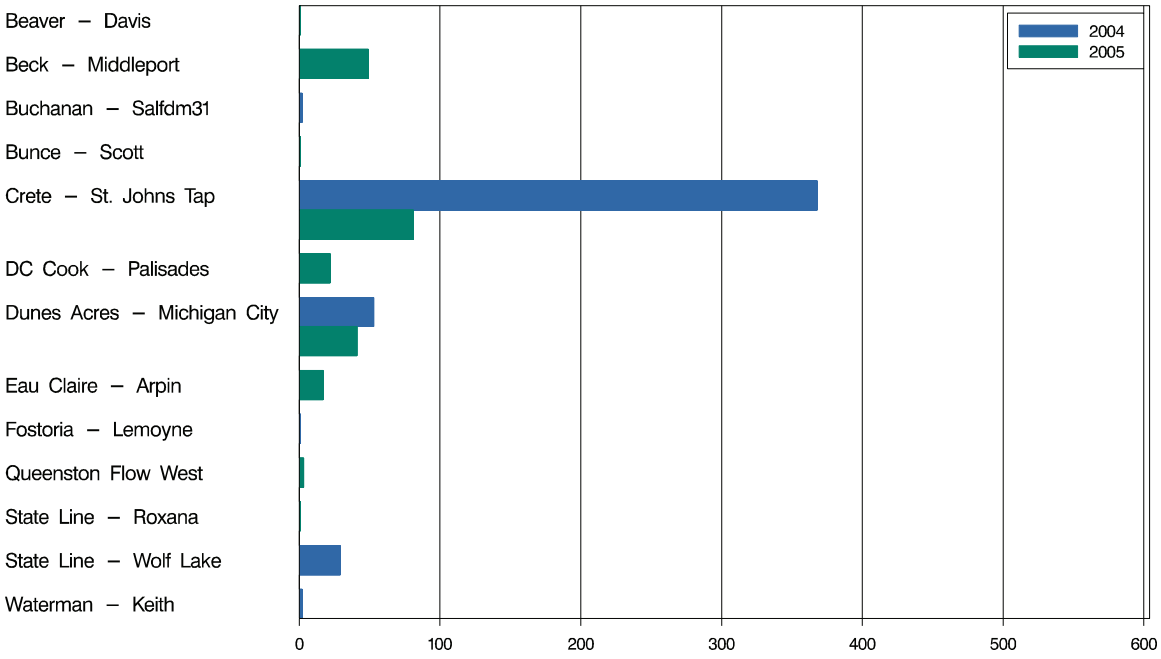
A congestion event exists when a unit or units must be dispatched out-of-merit order to control the impact of a contingency on a monitored facility or to control an actual overload. Congestion-event hours refer to the total number of congestion hours for a particular facility. A congestion-event hour differs from a constraint hour which is any hour during which one or more facilities are congested. Constraints are often simultaneous and, therefore, total congestion-event hours can exceed the number of hours in a year. Congestion frequency reported in this section follows 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. These five-minute intervals need not be consecutive within the hour. During calendar year 2005, 306 monitored facilities were constrained, 121 more than had been constrained during 2004. In 2005, there were 17,524 congestion-event hours, a 56 percent increase from 11,205 in 2004. Included in the total for 2004 were 2,512 congestion-event hours associated with the Phase 2 transmission Pathway between PJM and the ComEd Control Area before the integration of the AEP and DAY Control Zones in Phase 3.

Before Phase 2 integration began, PJM and the Midwest ISO had developed a JOA[14] which defines a coordinated methodology for congestion management. This protocol establishes reciprocal, coordinated flowgates in the combined footprint whose operating limits are respected by both operators. A flowgate is a single or group of transmission elements intended to model MW flow and its impact on transmission limitations and transmission service usage.[15] PJM models these coordinated flowgates and controls for them in its security-constrained economic dispatch. To date, the most significant of these has been the Crete–St. Johns Tap line located near the southern tip of Lake Michigan. The Crete–St. Johns Tap line

14 See "Joint Operating Agreement between the Midwest Independent Transmission System Operator, Inc. and PJM" (March 1, 2004). The agreement is referred to here as the JOA.
15 See NERC Operating Manual, "Flowgate Administration Reference Document," Version 1 (March 21, 2002).

accounted for 81 of the 216 congestion-event hours caused by Midwest ISO flowgates during 2005. Midwest ISO flowgates accounted for 1.2 percent of the total PJM congestion-event hours during 2005. Figure 7-2 shows the number of hours during which PJM took dispatch action to control various Midwest ISO flowgates during calendar year 2005.

Figure 7-2 - Congestion-event hours (By facility) for Midwest ISO flowgates impacting PJM dispatch : Calendar years 2004 to 2005



Congestion by Facility Type

The total number of PJM congestion-event hours increased by about 56 percent to 17,524 hours in 2005 from 11,205 hours in 2004. The 2005 increase in congestion-event hours was attributable to increases on several 500 kV facilities and the expansion of PJM with the integrations of DLCO on January 1, 2005, and Dominion on May 1, 2005. As new control zones were integrated in 2004 and 2005, both the number of monitored transmission facilities and the number of constrained facilities increased simply due to the expanded PJM market footprint.

Congestion frequency on transformers, lines and interfaces all showed increases compared to 2004 levels. The Wylie Ridge transformer and Bedington-Black Oak line in the AP Control Zone and the Kammer transformer in the AEP Control Zone together accounted for 4,045 congestion-event hours or 23 percent of total PJM congestion-event hours in 2005.

Congestion frequency on Midwest ISO flowgates decreased by 53 percent as compared to 2004 levels. The 216 congestion-event hours during 2005 represented a 239-hour reduction as compared to the 455 congestion-event hours in 2004. Congestion on Midwest ISO flowgates constituted 1.2 percent of total PJM congestion-event hours in 2005. The largest reduction in congestion-event hours among Midwest ISO flowgates was Crete-St Johns Tap. In 2005, Crete-St Johns Tap was constrained for 81 hours as compared to the 368 congestion-event hours experienced during 2004.

Congestion on interfaces increased 44 percent from 1,018 event hours in 2004 to 1,463 event hours during 2005. Interfaces typically include multiple transmission facilities and are used to represent the flow into or through a wider geographic area. Interface congestion constituted 8 percent of total PJM congestion-event hours in 2005. Among interfaces, the 5004/5005 interface showed the greatest increase in congestion frequency with 567 event hours in 2005 as compared to 19 event hours during 2004. The 5004/5005 interface accounted for 39 percent of all interface congestion during 2005. During 2005, PJM more frequently used the 5004/5005 interface instead of the Central Interface when the limiting facility was the Juniata 500 kV bus. PJM determined that controlling the transmission system using the 5004/5005 interface constraint reduced the wide-area system impact of the Central Interface and resulted in generation shifts which were more consistent with relieving the voltage problems at Juniata.

Congestion on lines increased 121 percent from 4,622 event hours in 2004 to 10,230 event hours during 2005. Line congestion accounted for 58 percent of the total PJM congestion-event hours for 2005. The Bedington-Black Oak 500 kV line and the Laurel-Woodstown 69 kV line together accounted for 2,193 congestion-event hours or 21 percent of all line congestion during 2005. These two facilities were the third and forth most congested facilities, respectively, in PJM during 2005. Also significant was the Mount Storm-Pruntytown 500 kV line with 696 congestion-event hours during 2005.

Congestion on transformers increased 116 percent from 2,598 event hours in 2004 to 5,615 event hours during 2005. Congestion on transformers accounted for 32 percent of the total PJM congestion-event hours for 2005. The Wylie Ridge and Kammer transformers together accounted for 2,731 congestion-event hours or 49 percent of all transformer congestion-event hours during 2005. The Wylie Ridge and Kammer transformers were the two most frequently congested facilities in PJM during 2005. Allegheny Power reduced the ratings of both the Kammer and Wylie Ridge transformers during 2005, contributing to the increase in congestion frequency on these facilities.

The 412 hours of congestion experienced on the Branchburg transformers was down from the 1,005 hours experienced during 2004 and constituted the greatest decrease in congestion frequency of any facility in PJM compared to 2004. On March 17, 2004, PSEG significantly reduced the emergency and normal ratings of the Branchburg number 1 and number 2 transformers because of a deteriorating condition identified during an inspection. On May 25, 2004, a special protection scheme (SPS) was implemented at Branchburg to reduce the impact on congestion from the derated facilities. A third transformer was installed at Branchburg on April 25, 2005, to relieve this constraint.

Figure 7-3 provides congestion-event hour subtotals comparing calendar year results by facility type: line, transformer, interface and flowgate.

Figure 7-3 - Congestion-event hours (By facility type): Calendar years 2002 to 2005

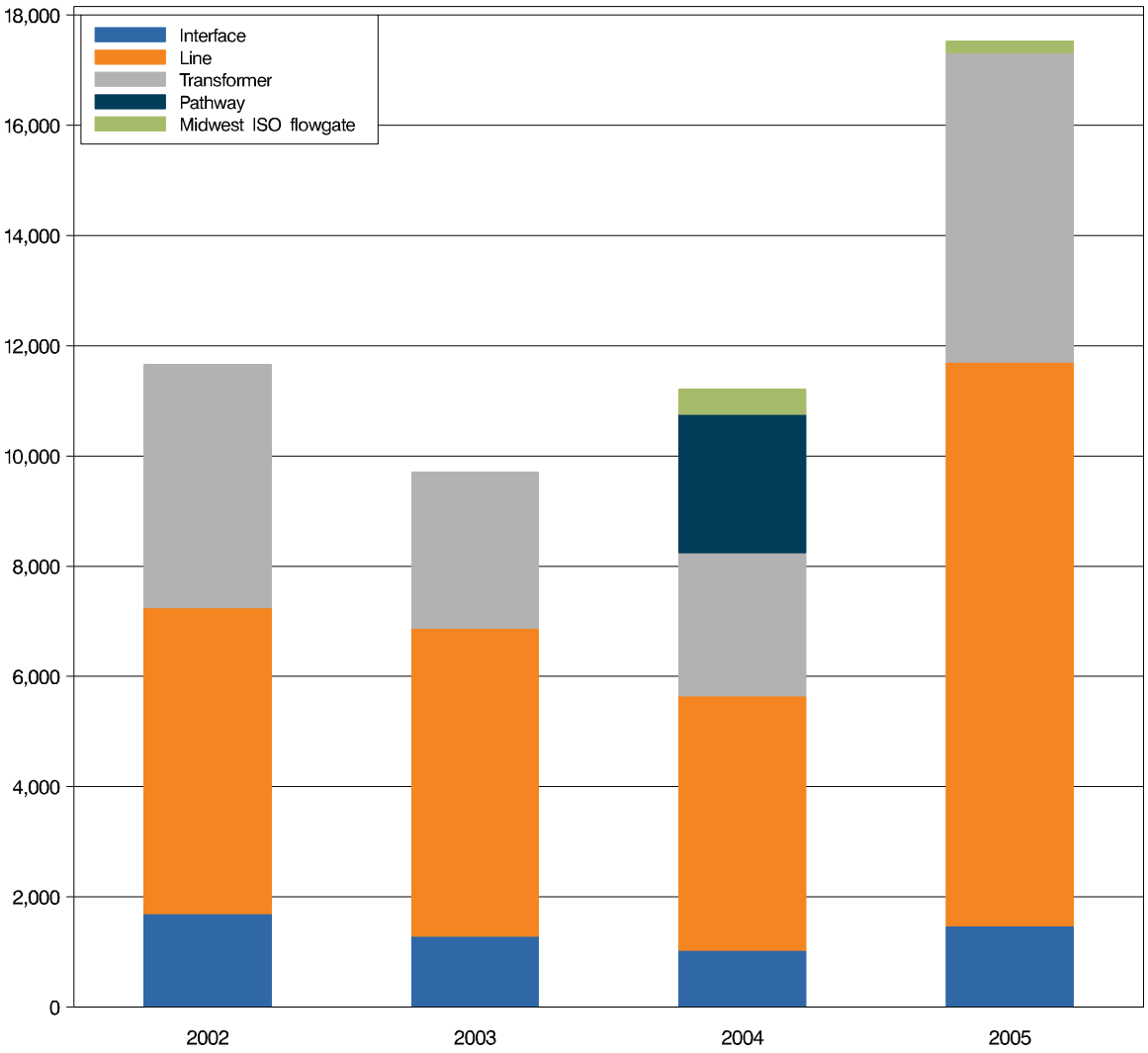
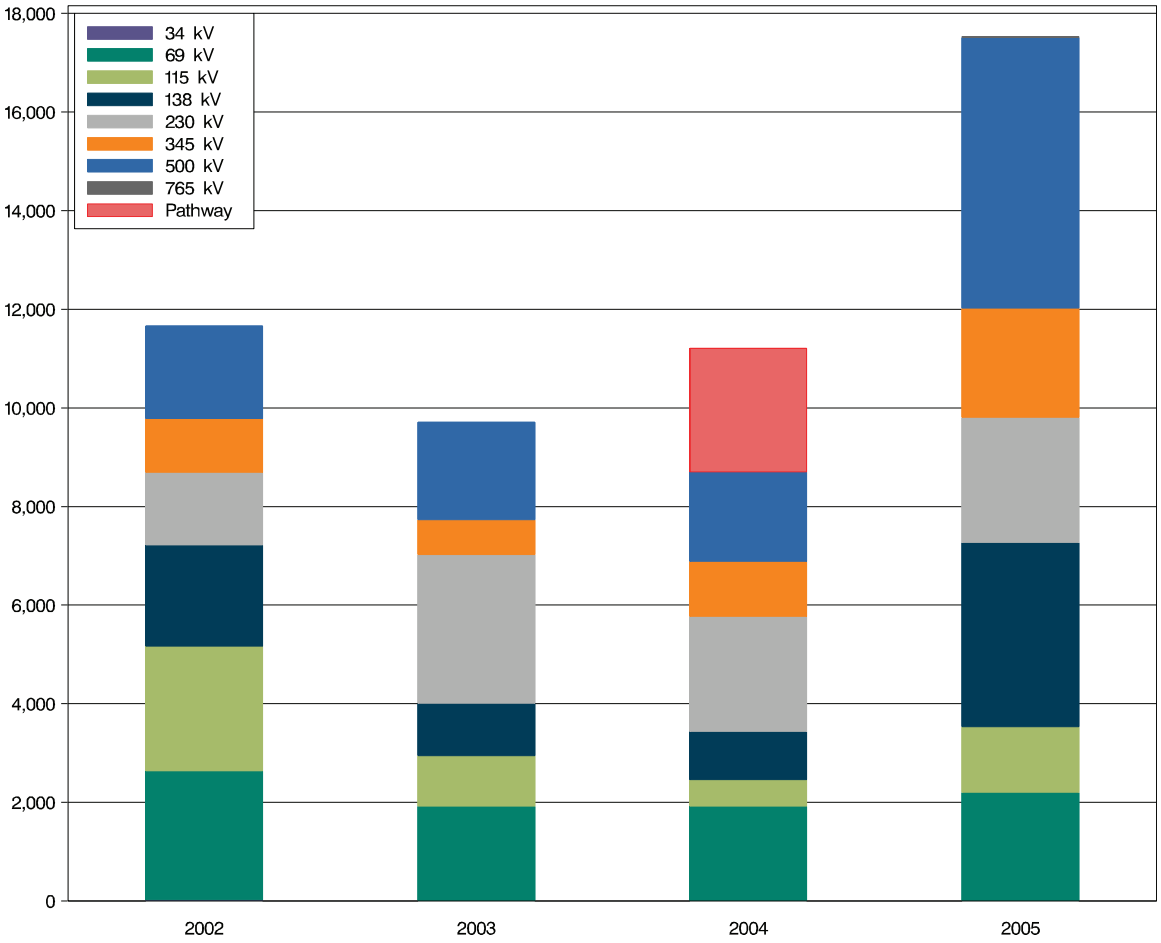


Figure 7-4 depicts congestion-event hour subtotals by facility voltage class. Congestion frequency increased across all voltage classes during 2005 as compared to 2004. The largest increase in congestion by voltage class was on 138 kV facilities. Congestion on 138 kV facilities increased by 283 percent with 3,741 event hours in 2005 as compared to the 977 event hours experienced during 2004. The largest contributions to congestion on 138 kV facilities came from the Charleroi-Mitchell line in the AP Control Zone and the Mahans Lane-Tidd line in the AEP Control Zone. These two facilities together experienced 766 congestion-event hours in 2005 constituting 20 percent of all congestion on 138 kV facilities and 4 percent of total PJM congestion-event hours.

Congestion on 500 kV facilities increased 204 percent with 5,494 congestion-event hours in 2005 as compared to the 1,809 congestion-event hours experienced during 2004. The largest contributors to 500 kV congestion were the Kammer transformer and the Bedington-Black Oak line. Together these facilities experienced 2,646 congestion-event hours or 48 percent of total 500 kV facility congestion during 2005. These facilities were also the second and third most frequently congested facilities, respectively, in PJM during 2005.

Congestion on 230 kV facilities increased by 8 percent with 2,537 congestion-event hours in 2005 as compared to the 2,340 congestion-event hours experienced during 2004. The largest contributor to 230 kV congestion was the Branchburg transformers located in the PSEG Control Zone. With 412 congestion-event hours, the Branchburg transformers constituted 16 percent of total 230 kV facility congestion. The Branchburg transformers also showed the greatest decrease in congestion frequency as compared to 2004 of any PJM facility. During 2004, the Branchburg transformers were the third most frequently constrained facility in PJM with 1,005 congestion-event hours. Both the Branchburg number 1 and number 2 500/230 kV transformers had previously experienced enough unhedgeable congestion to trigger the opening of a market window. The market windows for each of these facilities closed on May 18, 2005, with both transformers scheduled to be replaced by June 2007.

Figure 7-4 - Congestion-event hours (By facility voltage): Calendar years 2002 to 2005



Constraint Duration

Table 7-6 lists calendar year 2004 and 2005 constraints that affected more than 10 percent of PJM load or that were most frequently in effect and shows changes in congestion-event hours during both years.[16]

Constraints 1 through 8 are the primary operating interfaces. For this group, the number of congestion-event hours increased from 2,235 to 4,416 hours between 2004 and 2005, a 98 percent increase. The AP Control Zone facilities, items number 1, 2, 3 and 7, were constrained 4,062 hours in 2005, a 117 percent increase in frequency compared to 2004. This increase was driven by increased congestion frequency on the Kammer and Wylie Ridge transformers. Allegheny Power reduced the ratings of both the Kammer and Wylie Ridge transformers during 2005 contributing to the increase in congestion frequency on these facilities. The PJM Mid-Atlantic Region facilities, items number 4, 5, 6 and 8, were constrained 354 hours, a 3 percent decrease versus 2004.

Table 7-6 - Congestion-event summary: Calendar years 2004 to 2005

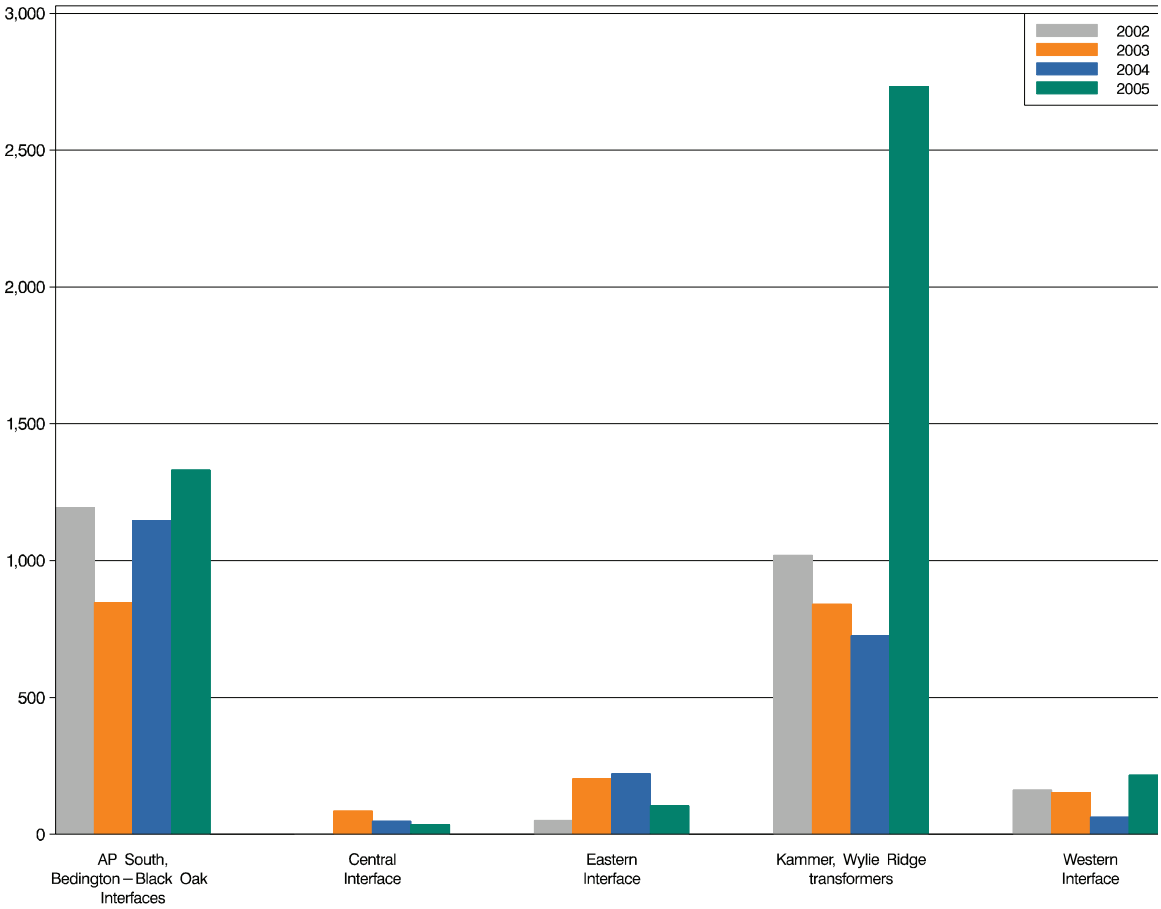
No.	Constraint	Congestion-Event Hours			Percent of Annual Hours		
		2004	2005	Change	2004	2005	Change
1	Wylie Ridge Transformer	642	1,399	757	7%	16%	9%
2	Kammer Transformer	84	1,332	1,248	1%	15%	14%
3	Bedington - Black Oak	1,131	1,314	183	13%	15%	2%
4	Western Interface	63	216	153	1%	2%	2%
5	Eastern Interface	221	103	(118)	3%	1%	(1%)
6	Central Interface	48	35	(13)	1%	0%	(0%)
7	AP South Interface	13	17	4	0%	0%	0%
8	PJM West 500	33	0	(33)	0%	0%	(0%)
9	Laurel - Woodstown	401	879	478	5%	10%	5%
10	Mount Storm - Pruntytown	0	696	696	0%	8%	8%
11	5004/5005 Interface	19	567	548	0%	6%	6%
12	Cloverdale - Lexington	31	508	477	0%	6%	5%
13	Mahans Lane - Tidd	69	448	379	1%	5%	4%
14	Cedar	605	438	(167)	7%	5%	(2%)
15	Doubs - Mount Storm	87	422	335	1%	5%	4%
16	Branchburg	1,005	412	(593)	11%	5%	(7%)
17	Kanawha - Matt Funk	51	401	350	1%	5%	4%
18	Cedar Grove - Roseland	150	364	214	2%	4%	2%
19	Doubs	85	321	236	1%	4%	3%
20	Charleroi - Mitchell	10	318	308	0%	4%	4%
21	Absecon - Lewis	0	283	283	0%	3%	3%
22	Bair - Hill	27	225	198	0%	3%	2%
23	Mitchell - Shepler Hill	42	214	172	0%	2%	2%
24	Bedington - Nipetown	21	213	192	0%	2%	2%
25	Edison - Meadow Rd	33	191	158	0%	2%	2%

16 Constrained-hour data presented here use the convention that if congestion occurs for 20 minutes or more in an hour, the hour is congested.

Congestion-Event Hours by Facility

Constraints that affected regions during calendar years 2002 through 2005 are presented in Figure 7-5. The Bedington-Black Oak line and the Kammer and Wylie Ridge transformers were the most significant regional constraints, and together comprised 23 percent of total PJM congestion-event hours during 2005. Congestion on the Bedington-Black Oak line increased by 183 hours or 16 percent during 2005 as compared to 2004. The Kammer transformer was constrained for 1,332 hours during 2005 as compared to 84 hours during 2004. The Wylie Ridge transformers experienced 1,399 congestion-event hours during 2005 as compared to 642 congestion-event hours during 2004.

Figure 7-5 - Regional constraints and congestion-event hours (By facility): Calendar years 2002 to 2005

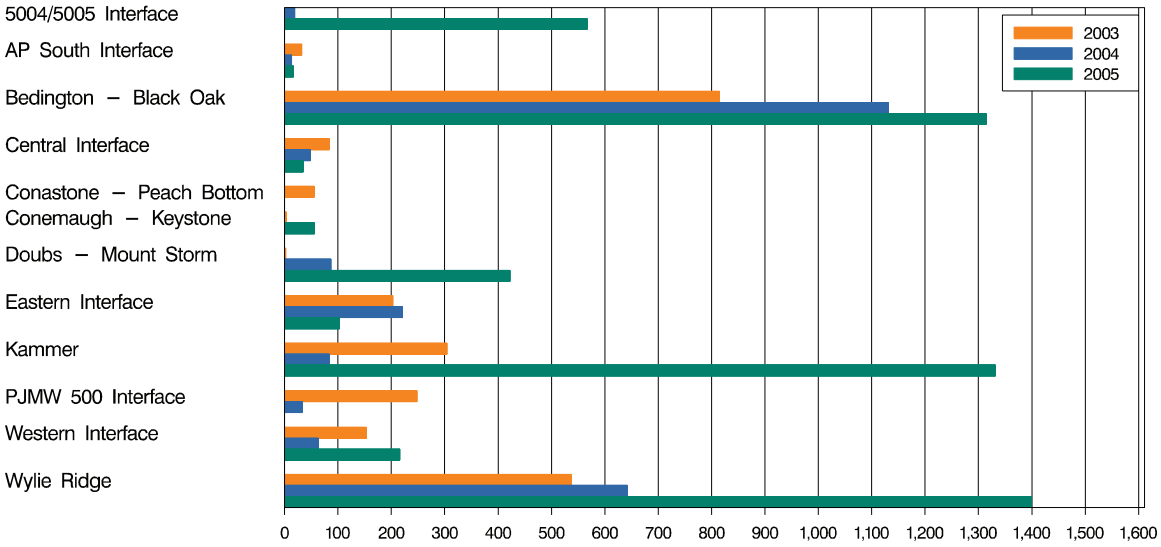


Congestion-Event Hours for the 500 kV System

Constraints on the 500 kV system generally have a regional impact. Figure 7-6 shows the occurrences of 500 kV constraints. Total 500 kV zone congestion increased by 13 percent from 4,928 congestion-event hours in 2004 to 5,548 congestion-event hours during 2005. The Wylie Ridge 500/345, Kammer 765/500, Bedington-Black Oak and 5004/5005 interface were constrained a combined total of 4,612 congestion-

event hours in 2005 as compared to 1,876 hours in 2004, an increase of 2,736 hours or 146 percent. Allegheny Power reduced the ratings of both the Kammer and Wylie Ridge transformers during 2005 contributing to the increase in congestion frequency on these facilities. On August 11, 2005, Allegheny Power reduced the rating of the Wylie Ridge number 7 500/345 kV transformer by approximately 13 percent based on the results of a power transformer loadability study. Similarly, on June 30, 2005, Allegheny Power reduced the rating of the Kammer number 2 765/500 kV transformer between approximately 6 percent and 20 percent. The level of unhedgeable congestion on the Wylie Ridge transformer during 2004 led PJM to open a market window under the PJM economic planning process. The market window closed for Wylie Ridge number 5 500/345 kV transformer on April 1, 2005, and on the Wylie Ridge number 7 500/345 kV transformer on July 20, 2005. AP plans to upgrade the coolers on the existing Wylie Ridge 500/345 kV number 7 transformer prior to the summer of 2006 and will install a third 500/345 kV transformer at Wylie Ridge prior to June 2007. In the PJM Mid-Atlantic Region, the Western, Central and Eastern Interfaces were constrained a total of 354 hours, a 7 percent increase over the 332 hours experienced during 2004.

Figure 7-6 - 500 kV zone congestion-event hours (By facility): Calendar years 2003 to 2005



Congestion-Event Hours for 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. During 2005, Bedington-Black Oak and AP South were constrained 1,314 hours and 17 hours, respectively. During 2004, Bedington-Black Oak and AP South were constrained 1,131 hours and 13 hours, respectively. With

1,314 congestion-event hours, Bedington-Black Oak was the third most frequently constrained facility in PJM during calendar year 2005. Bedington-Black Oak experienced sufficient unhedgeable congestion during 2004 to trigger the opening of a market window under the PJM economic planning process. The market window for Bedington-Black Oak closed on March 4, 2005. Two solutions were proposed for the relief of congestion on Bedington-Black Oak. The first of these solutions addresses the reactive limitation and is comprised of a 525 MVar Static Var Compensator (SVC) to be installed at Black Oak prior to summer 2009. The second solution addresses the thermal limitation of the line and constitutes the replacement of a wave trap. The replacement of the wave trap was originally to be performed as a merchant transmission project (queue M05)[17] and had been designated as a market solution to the unhedgeable congestion. Allegheny Power subsequently replaced the wave trap in December of 2005. The MMU concluded that the AP Control Zone's South Interface constraint was competitive enough to be exempt from offer-capping procedures and recommended this modification in an August 26, 2004, filing to the United States Federal Energy Regulatory Commission (FERC).[18] Prior to the integration of the AP Control Zone into PJM on April 1, 2002, the primary controlling action for these constraints had been for AP to restrict energy transfers through its system, including transfers from western resources to PJM and Dominion Virginia Power. This action had the effect of raising the overall PJM dispatch rate higher than it would have been if the transactions had not been curtailed. The result was increased energy prices for the entire PJM Mid-Atlantic Region, regardless of location. There was no impact on measured congestion because the entire PJM system was affected.

Zonal Congestion

Constraints within specific zones from calendar years 2002 through 2005 are presented in Figure 7-7 which compares the frequency of constraints that occurred in each zone and on the 500 kV system. In 2005, the PSEG Control Zone had 1,761 congestion-event hours, a 7 percent decrease versus 2004.[19] A significant contribution to the decrease in constrained operation on the PSEG system was the installation of a third 500/230 kV transformer at Branchburg which went into service on April 25, 2005. The Branchburg transformer was constrained 1,005 hours during 2004, but only 412 hours in 2005, though it remained the most frequently constrained facility in the PSEG Control Zone.

The AP Control Zone had the greatest overall increase in congestion frequency as compared to 2004. Congestion in the AP Control Zone increased by 746 percent with 2,877 congestion-event hours during 2005 as compared to 340 congestion-event hours during 2004. The most significant contributors to this increase were the Doubs transformers and the Mount Storm-Pruntytown line. Together, these two facilities were constrained for 1,222 hours constituting 42 percent of the total AP Control Zone congestion-event hours.

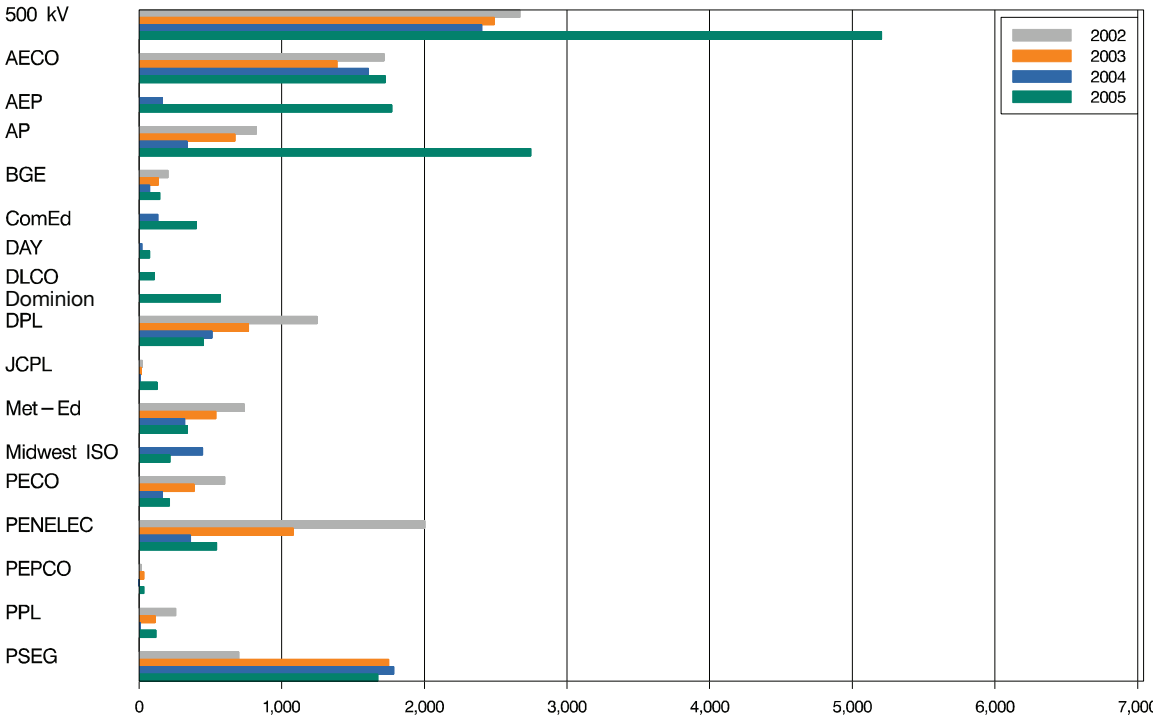
The AEP Control Zone experienced 1,901 congestion-event hours during 2005 constituting 11 percent of total PJM congestion-event hours for the year. During 2004, the AEP Control Zone was a part of PJM during the last three months of the year and experienced 168 congestion-event hours. The Mahans Lane-Tidd, Kanawha-Matt Funk and Cloverdale–Lexington lines saw increased congestion frequency as compared to 2004 and were the most frequently constrained facilities in the AEP Control Zone during 2005. These three facilities together had 1,357 congestion-event hours or 71 percent of all AEP Control Zone congestion.

17 See PJM, "#M05 Black Oak – Bedington 500 kV Wave Trap (Revised)" <http://www.pjm.com/planning/project-queues/merch-feas_docs/m05_fea.pdf > (117 KB).

18 *PJM Interconnection, L.L.C.*, Compliance Filing, Docket Nos. ER04-539-001, 002 and ER04-121-000 (October 26, 2004), Report of the PJM Market Monitor, P 17.

19 The value reported in the *2004 State of the Market Report*, 1,784 hours, was the number of constraint hours. The number of congestion-event hours during 2004 in the PSEG Control Zone was 1,895. As stated in the *2004 State of the Market Report*, PSEG had the highest number of congestion-event hours of any control zone during 2004.

Figure 7-7 - Constraint hours (By zone): Calendar years 2002 to 2005



Zonal and Subarea Congestion

Figure 7-8 through Figure 7-40 present constraints by control zones and subareas, and demonstrate the influence of individual constraints on zonal prices during calendar year 2005. Constraints can have wide-ranging effects, influencing prices across multiple zones. To illustrate this, the figures depict the congestion component of each zone's annual average LMP. The effects of each constraint during calendar year 2005 are expressed as a percent of the control zone's annual average LMP. The top constraints affecting zonal LMP are depicted in the congestion component graphs.

Mid-Atlantic Region Congestion-Event Hours and Congestion Components

AECO Control Zone

Figure 7-8 shows AECO Control Zone constraints. In particular, the very small Cedar subarea, consisting of just two 69 kV substations, Motts Farm and Cedar, continued to be frequently constrained and accumulated enough unhedgeable congestion to trigger the opening of a market window under the PJM economic planning process during 2004. Cedar subarea congestion comprised 26 percent of AECO Control Zone congestion-event hours during 2005. On June 29, 2005, the Cedar-Cardiff 230 kV line was placed into service and is expected to significantly reduce congestion in the Cedar subarea. During 2005, the Cedar interface was constrained for 438 hours between January and June, but experienced no congestion from July through December. Also significant was the Laurel-Woodstown 69 kV line in southern New Jersey (SNJ), which comprised 50 percent of the total congestion-event hours in the AECO Control Zone and 5 percent of total PJM congestion-event hours during 2005. The Laurel-Woodstown 69 kV line with 879 congestion-event hours was the fourth most frequently constrained facility in PJM during 2005. This facility had accumulated enough unhedgeable congestion to trigger the opening of a market window which closed on March 4, 2005, with Conectiv to completely rebuild the circuit by summer 2007. The Shieldalloy-Vineland 69 kV line, also located in SNJ, experienced 444 hours of congestion during 2004 and triggered the opening of a market window through the PJM economic planning process. In 2005, this facility was constrained for 82 hours. The market window for the Shieldalloy-Vineland 69 kV line closed on March 4, 2005, with Conectiv planning to upgrade its portion of the circuit by summer 2006. This action will not eliminate the congestion as customer-owned equipment will then become the limiting element. PJM is in discussions with the customer that owns the limiting facilities regarding potential remedies. The Absecon-Lewis 69 kV line had 283 congestion-event hours constituting 16 percent of AECO Control Zone congestion-event hours during 2005. This facility accumulated enough unhedgeable congestion to trigger the opening of a market window under the PJM economic planning process on November 8, 2005. This window is scheduled to close on November 8, 2006.

Figure 7-8 - AECO Control Zone congestion-event hours (By facility): Calendar years 2003 to 2005

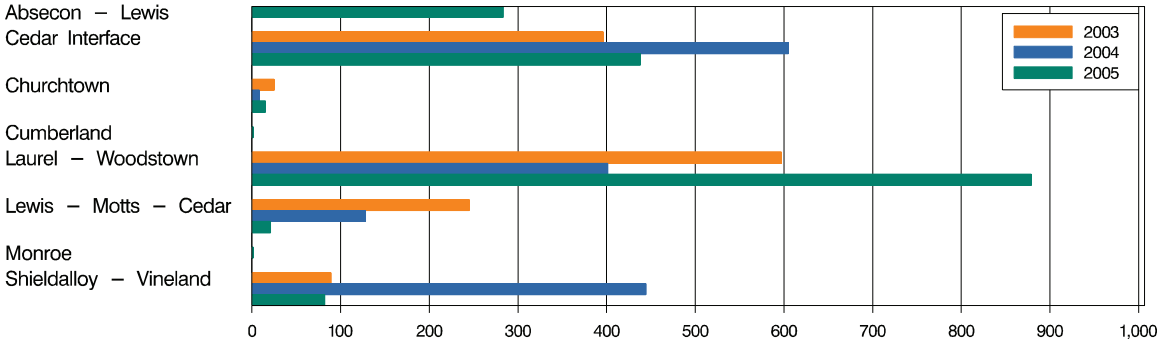
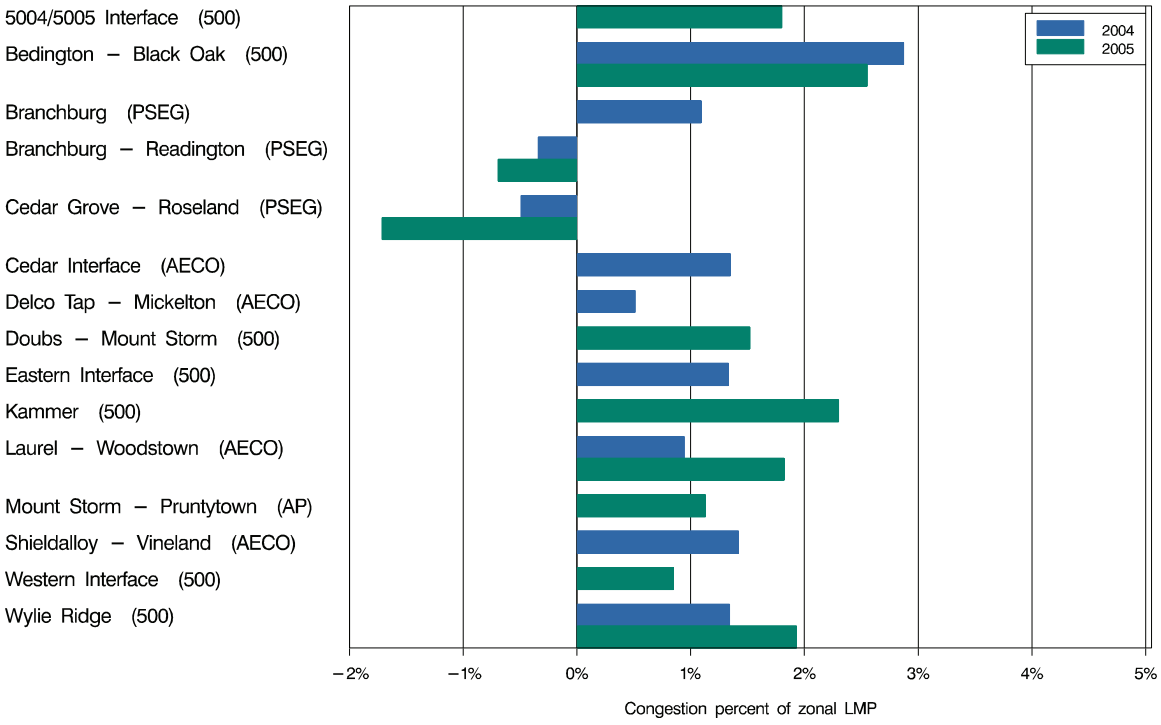


Figure 7-9 depicts the congestion components of AECO Control Zone LMP. The Bedington-Black Oak, Kammer transformer and Wylie Ridge transformer constraints caused the greatest increase in prices within the AECO Control Zone. The Cedar Grove-Roseland constraint caused the greatest decrease in prices in the AECO Control Zone.

Figure 7-9 - AECO Control Zone congestion components: Calendar years 2004 to 2005



BGE Control Zone

Figure 7-10 illustrates the BGE Control Zone constraints. With 151 congestion-event hours, the BGE Control Zone comprised 1 percent of the total PJM congestion-event hours in 2005. The Center-Westport 115 kV line was constrained 104 hours and was the only BGE Control Zone facility with greater than 100 congestion-event hours during 2005.

Figure 7-10 - BGE Control Zone congestion-event hours (By facility): Calendar years 2003 to 2005

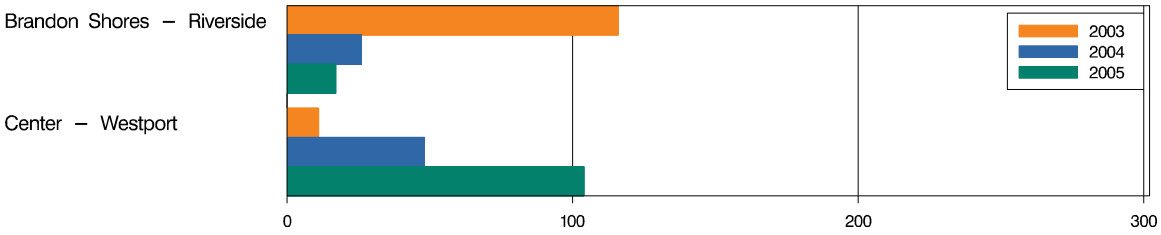
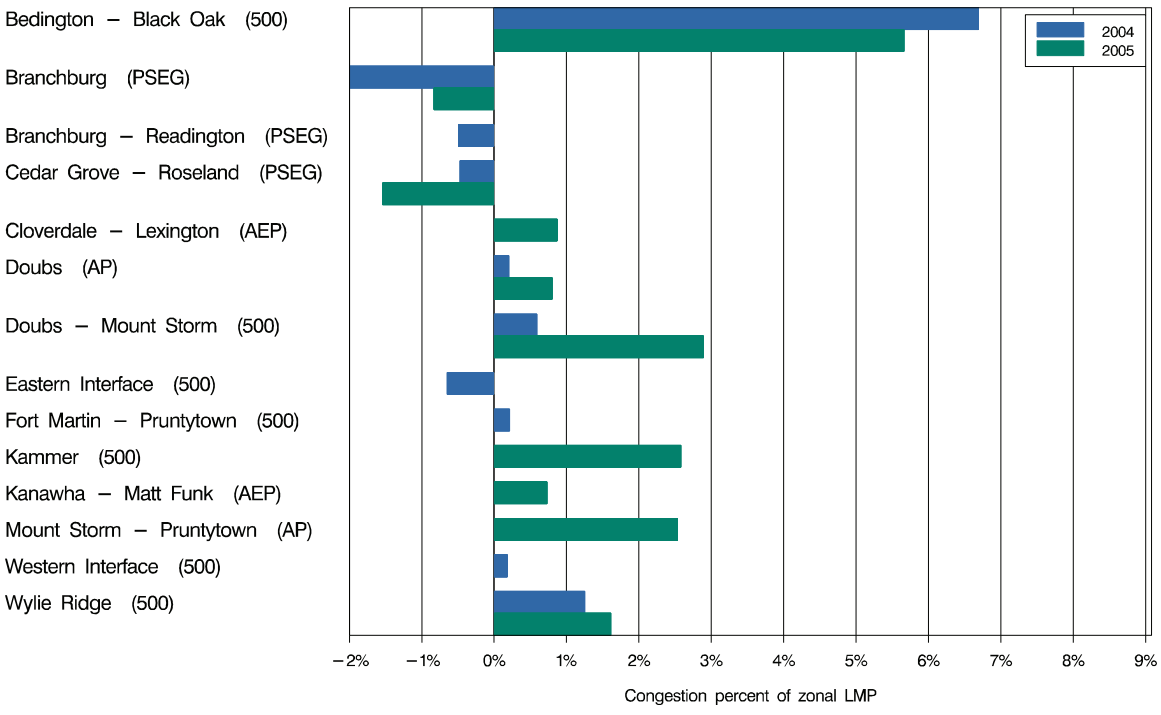


Figure 7-11 depicts the congestion components of the BGE Control Zone LMP. The Bedington-Black Oak constraint caused the greatest increase in prices while the Cedar Grove-Roseland constraint in PSEG caused the greatest decrease in prices in the BGE Control Zone.

Figure 7-11 - BGE Control Zone congestion components: Calendar years 2004 to 2005



DPL Control Zone

Figure 7-12 depicts DPL Control Zone constraint occurrences. During 2005, congestion-event hours in the DPL zone fell 14 percent from 2004 levels. DPL zone congestion-event hours represented 3 percent of total congestion-event hours in PJM. In 2005, no single facility in the DPL Control Zone was constrained more than 100 hours as compared to 2004 when two facilities exceeded this mark. The Keeney AT5N transformer was constrained 27 hours during 2005 as compared to 102 congestion-event hours during 2004. Improvements at Keeney are the result of disconnect upgrades at Keeney. These upgrades were performed on the AT-50 and AT-51 transformers and were completed in March and April 2004, respectively. The Keeney AT51 transformer incurred sufficient unhedgeable congestion during 2004 to open a market window under the PJM economic planning process. The market window closed on March 4, 2005, with the decision not to perform a proposed upgrade consisting of the installation of an additional 500/230 kV transformer at Red Lion. Based on PJM's analysis, the cost of this proposed upgrade would exceed the derived benefit by a 5-to-1 ratio. Issues with PJM's approach to cost-benefit analysis for transmission upgrades are discussed below.

Figure 7-12 - DPL Control Zone congestion-event hours (By subarea): Calendar years 2002 to 2005

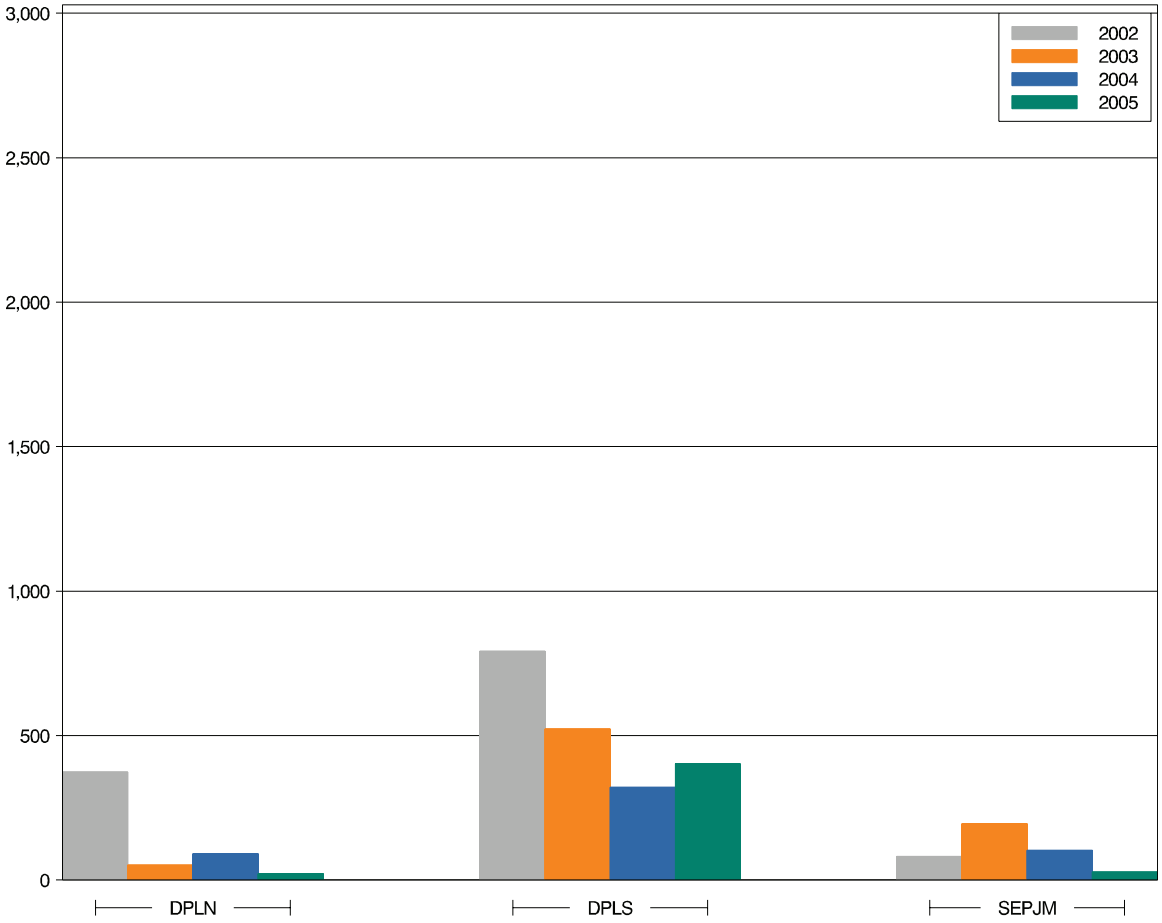


Figure 7-13 illustrates DPLS congestion-event hours by facility. Congestion in the DPLS subarea increased by 17 percent with 445 congestion-event hours in 2005 as compared to 381 congestion-event hours in 2004. No facility in DPLS was constrained more than 100 hours during 2005. Though it showed a 35 percent reduction in congestion frequency versus 2004, the Wye Mills AT2 69 kV transformer was constrained 83 hours and was the most frequently constrained facility in the DPL Control Zone in 2005. The Wye Mills AT2 transformer had previously incurred sufficient unhedgeable congestion to open a market window which closed on November 29, 2005. The transformer is to be replaced by the summer of 2006. The DuPont Seaford-Laurel 69 kV line, which had previously incurred sufficient unhedgeable congestion to open a market window under the PJM economic planning process, was constrained for 65 hours during 2005. The market window for this facility closed on March 4, 2005, with Conectiv to upgrade the circuit by the summer of 2006.

Figure 7-13 - DPLS subarea of the DPL Control Zone congestion-event hours (By facility): Calendar years 2002 to 2005

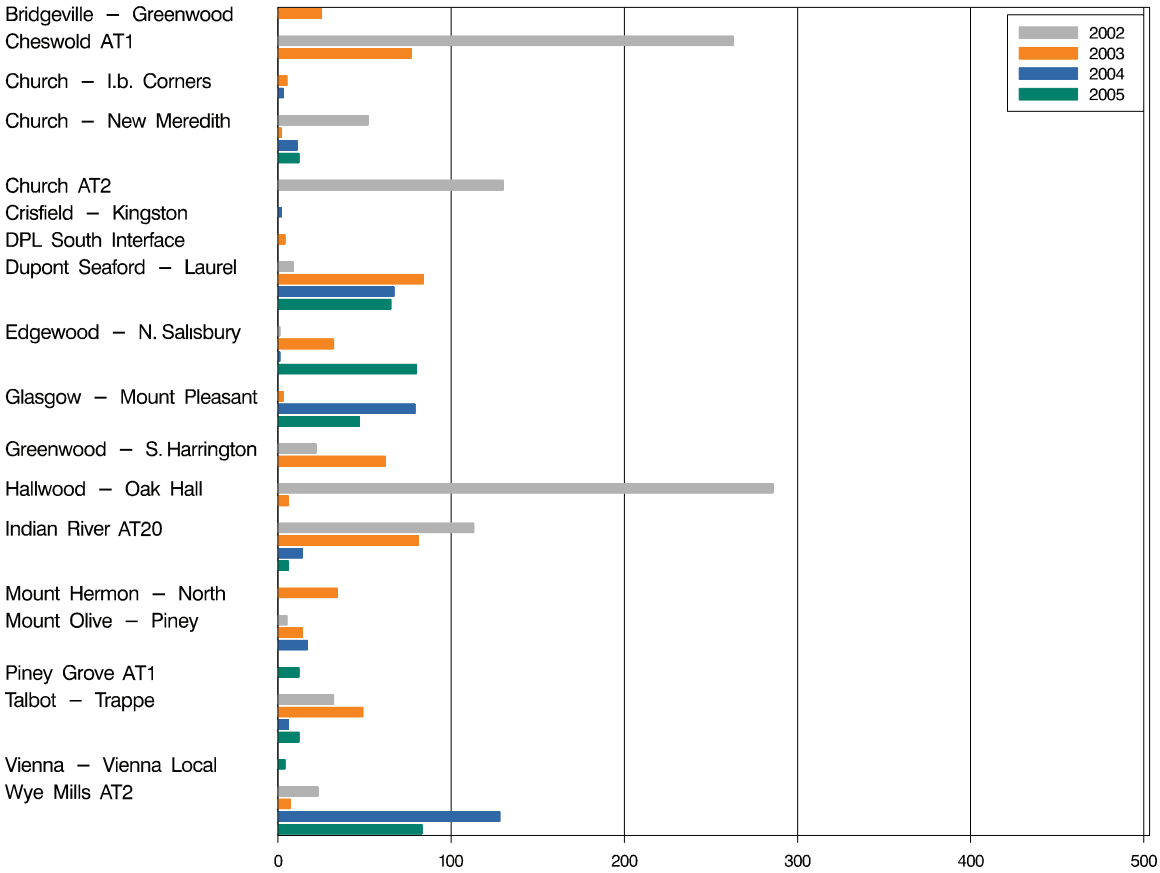
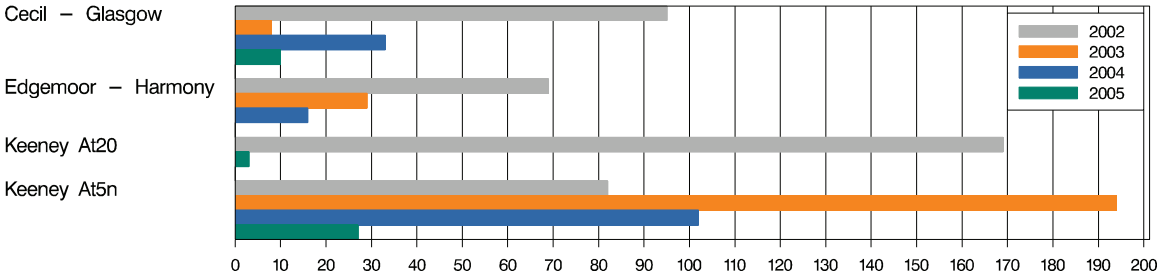


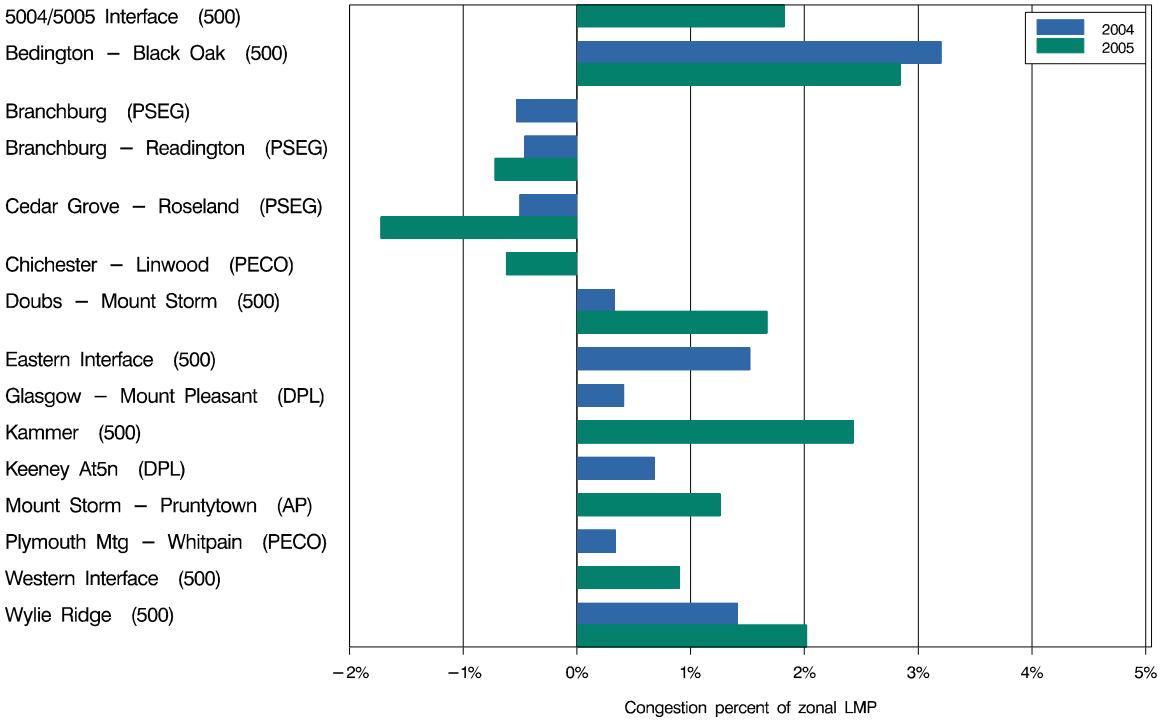
Figure 7-14 presents the same information for the DPLN and SEPJM subareas. The Keeney 500/230 kV transformer (Keeney AT5N), with 27 congestion-event hours, showed the largest decrease in frequency versus 2004 of any DPL Control Zone facility. No facilities were constrained more than 100 hours in DPLN or SEPJM in 2005.

Figure 7-14 - DPLN and SEPJM subareas of the DPL Control Zone congestion-event hours (By facility): Calendar years 2002 to 2005



As Figure 7-15 shows, the Bedington-Black Oak and Kammer transformer constraints caused the greatest increase in prices while the Cedar Grove-Roseland constraint caused the greatest decrease in prices in the DPL Control Zone.

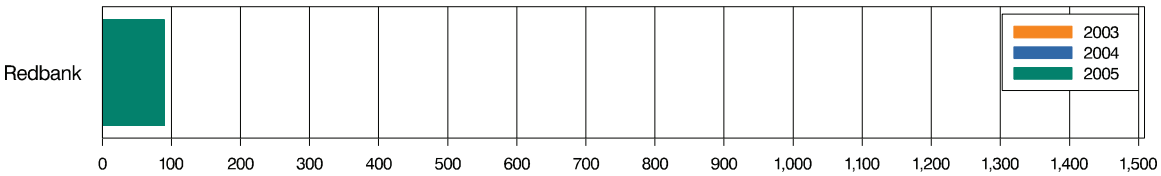
Figure 7-15 - DPL Control Zone congestion components: Calendar years 2004 to 2005



JCPL Control Zone

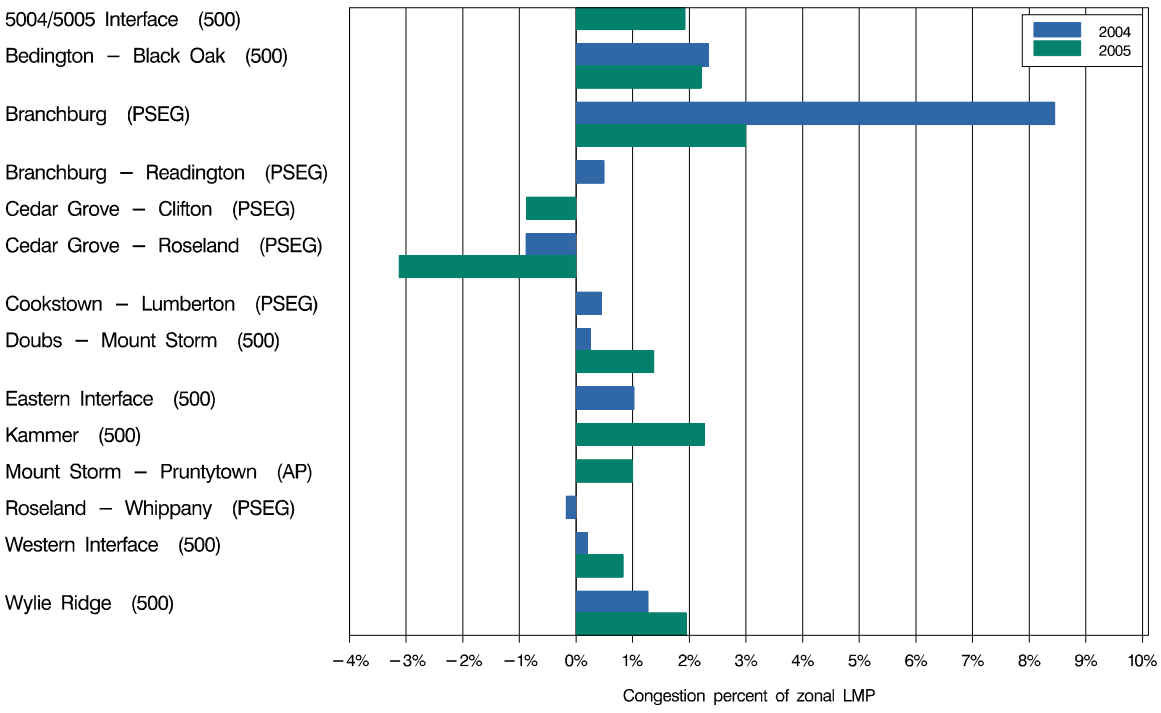
Figure 7-16 illustrates JCPL Control Zone constraints. The JCPL Control Zone has experienced little internal transmission congestion during the past two years. The JCPL Control Zone experienced nine congestion-event hours in 2004 and 125 congestion-event hours in 2005. Only one facility in the JCPL Control Zone was constrained more than 50 hours, the Redbank transformer with 90 congestion-event hours in 2005.

Figure 7-16 - JCPL Control Zone congestion-event hours (By facility): Calendar years 2003 to 2005



As Figure 7-17 shows, the Branchburg transformer Bedington-Black Oak and Kammer transformer constraints caused the greatest increase in prices while Cedar Grove-Roseland caused the greatest decrease in prices in the JCPL Control Zone.

Figure 7-17 - JCPL Control Zone congestion components: Calendar years 2004 to 2005



Met-Ed Control Zone

Figure 7-18 illustrates Met-Ed Control Zone constraints. Congestion in Met-Ed increased by 53 hours from 2004 levels, a 15 percent increase. The Met-Ed west subarea (MEW) congestion increased, constituting 93 percent of total Met-Ed congestion-event hours in 2005 as compared to 83 percent during 2004. The increase in congestion-event hours in the Met-Ed west subarea was attributable to an increase in congestion on the Bair-Hill 115 kV line which was the most constrained facility in the Met-Ed Control Zone during 2005. The 225 congestion-event hours on Bair-Hill constituted an eight-fold increase over the 27 hours of congestion on this facility in 2004. This facility incurred sufficient unhedgeable congestion to open a market window under the PJM economic planning process on November 8, 2005. This window is scheduled to close on November 8, 2006. The Jackson 230/115 kV transformer, another Met-Ed west subarea facility, had the greatest decrease in congestion of any Met-Ed Control Zone facility versus 2004. The Jackson transformer had been the most constrained facility in Met-Ed during 2004 with 231 congestion-event hours, but experienced only 46 hours of congestion during 2005. Both the Jackson and Yorkana A 230/115 kV transformers had previously experienced enough unhedgeable congestion to trigger the opening of a market window. The market windows for each of these facilities closed on March 4, 2005, with their ratings being increased prior to the summer of 2005. These rating increases were responsible for the significant decrease in congestion during 2005 as compared to previous years. In addition, FirstEnergy is scheduled to install a third transformer at Jackson prior to June of 2006.

Figure 7-18 - Met-Ed Control Zone congestion-event hours (By facility): Calendar years 2003 to 2005

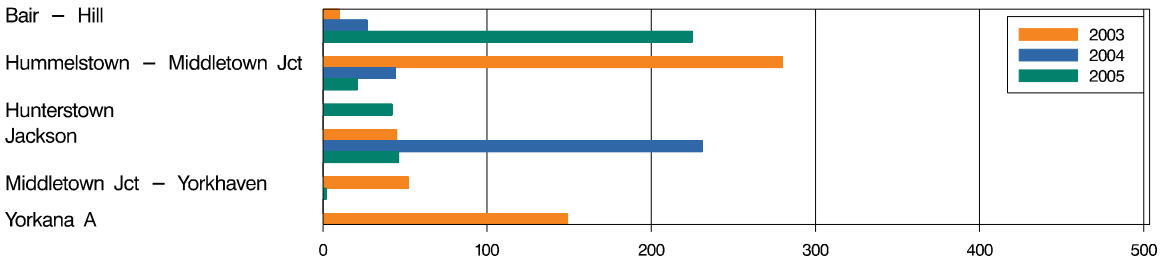
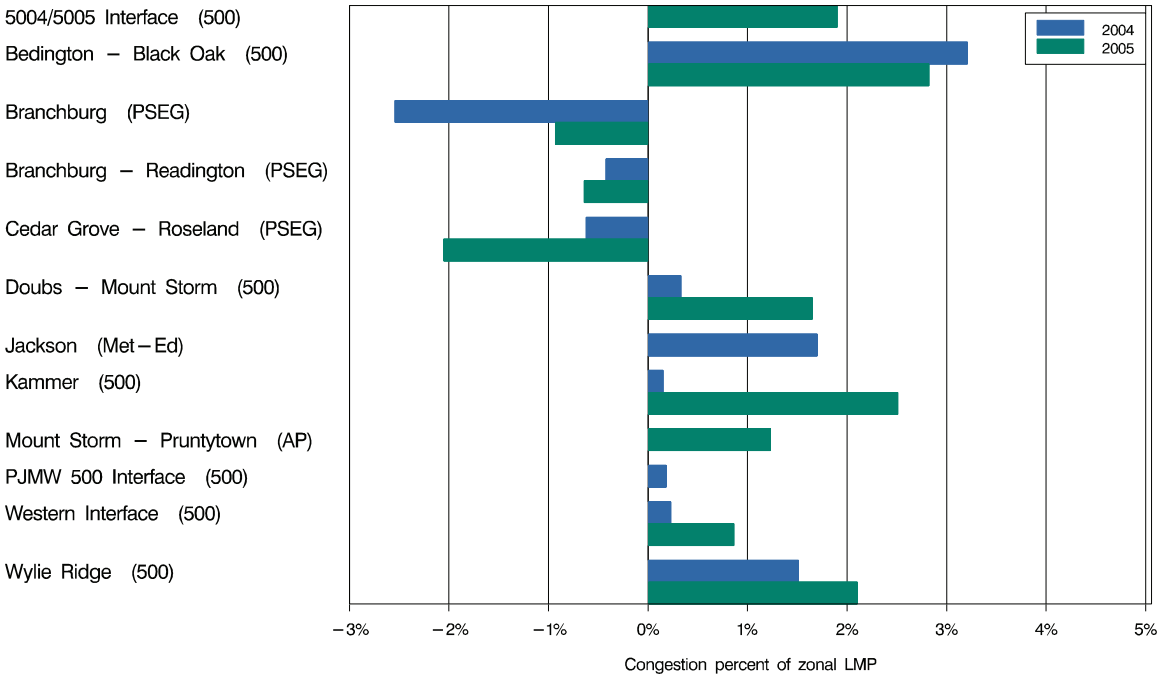


Figure 7-19 shows the congestion components of the Met-Ed Control Zone LMP. The Bedington-Black Oak, Kammer transformer and Wylie Ridge transformer constraints caused the greatest increase in prices while the Branchburg transformer and Cedar Grove-Roseland constraints caused the greatest decrease in prices in the Met-Ed Control Zone.

Figure 7-19 - Met-Ed Control Zone congestion components: Calendar years 2004 to 2005



PECO Control Zone

Figure 7-20 illustrates constraints in the PECO Control Zone where in 2005 only one facility was constrained more than 100 hours. The Chichester-Linwood 230 kV line with 128 congestion-event hours in 2005 was the most frequently constrained facility in the PECO Control Zone. The Whitpain 500/230 kV transformer was constrained for 59 hours during 2005, making it the second most constrained facility in the PECO Control Zone. There was a forced outage of the Whitpain number 2 500/230 kV transformer from July 2, 2005, through July 13, 2005.

The Whitpain 500/230 kV number 3 transformer accumulated enough unhedgeable congestion to trigger the opening of a market window under the PJM economic planning process on December 20, 2005. This window is scheduled to close on December 20, 2006.

Figure 7-20 - PECO Control Zone congestion-event hours (By facility): Calendar years 2003 to 2005

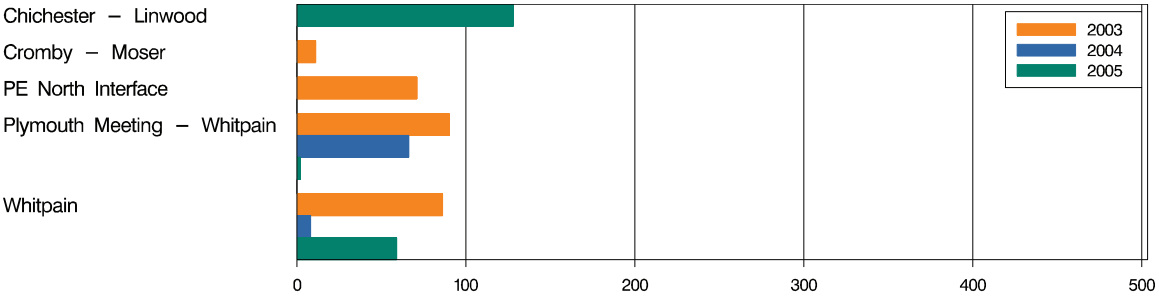
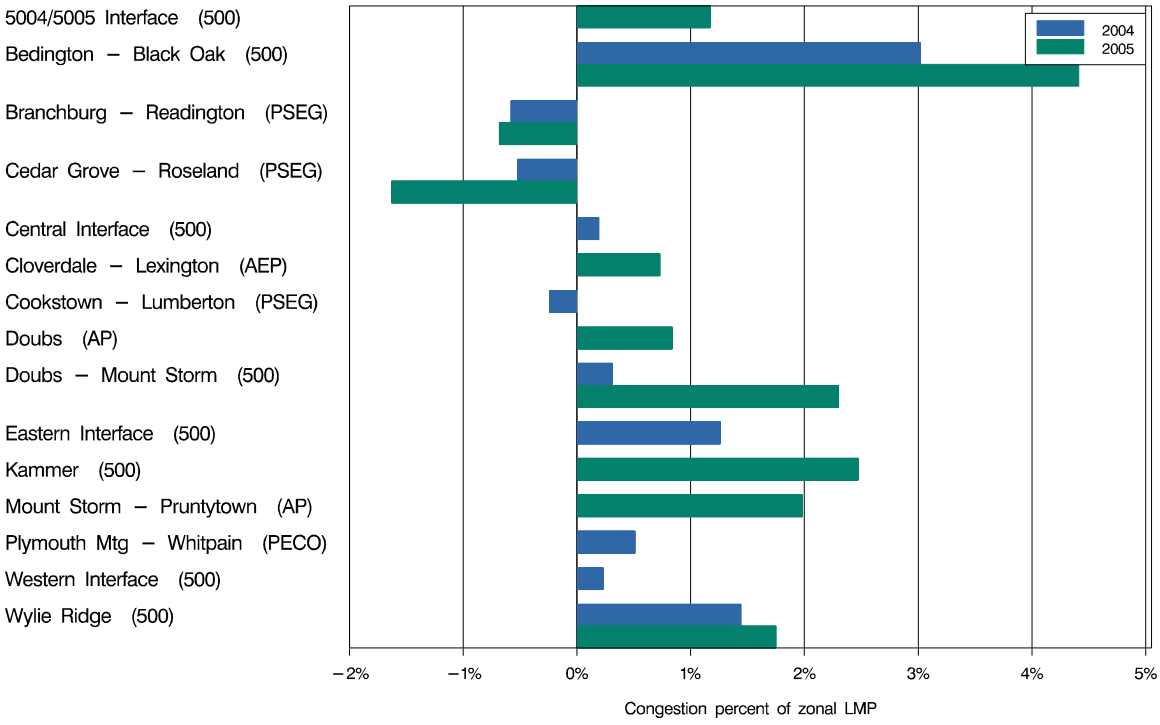


Figure 7-21 shows the congestion components of the PECO Control Zone LMP. The Bedington-Black Oak, Doubs-Mount Storm and Kammer transformer constraints caused the greatest increase in prices while the Cedar Grove-Roseland and Branchburg-Readington constraints in PSEG caused the greatest decrease in prices in the PECO Control Zone.

Figure 7-21 - PECO Control Zone congestion components: Calendar years 2004 to 2005



PENELEC Control Zone

Figure 7-22 illustrates PENELEC Control Zone constraints. Congestion-event hours in the PENELEC zone increased by 187 hours or 51 percent versus 2004, with most of the increase occurring in northwestern PENELEC. In 2004, the Erie West transformer experienced no congestion, a result of the installation of a second transformer at Erie West. With 142 congestion-event hours during 2005, the Erie West transformer was the most frequently constrained facility in PENELEC. Congestion on Erie West in 2005 occurred entirely during the month of May and was attributable to the concurrent outages of the Wayne 345/115 kV number 2 transformer and the Erie West #8 345 kV breaker. The Erie West #8 345 kV was out of service from April 18, 2005, through May 27, 2005. In total, the PENELEC Control Zone constituted 3 percent of total PJM congestion-event hours during 2005.

Figure 7-22 - PENELEC Control Zone congestion-event hours (By facility): Calendar years 2003 to 2005

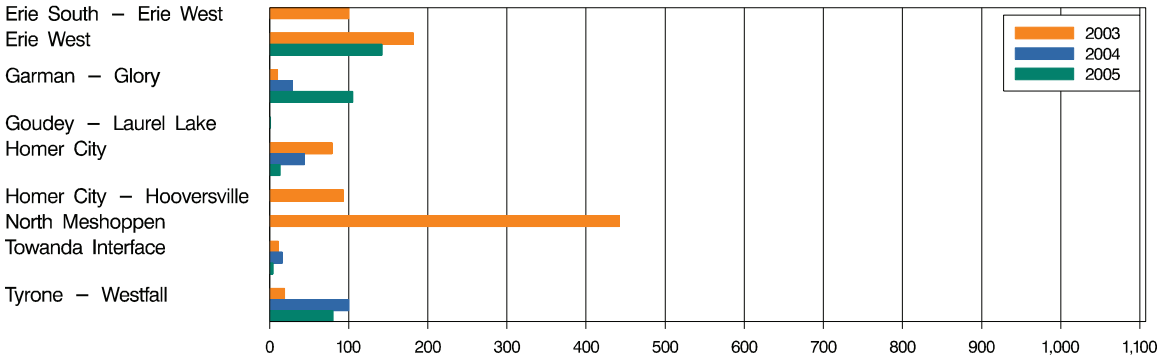
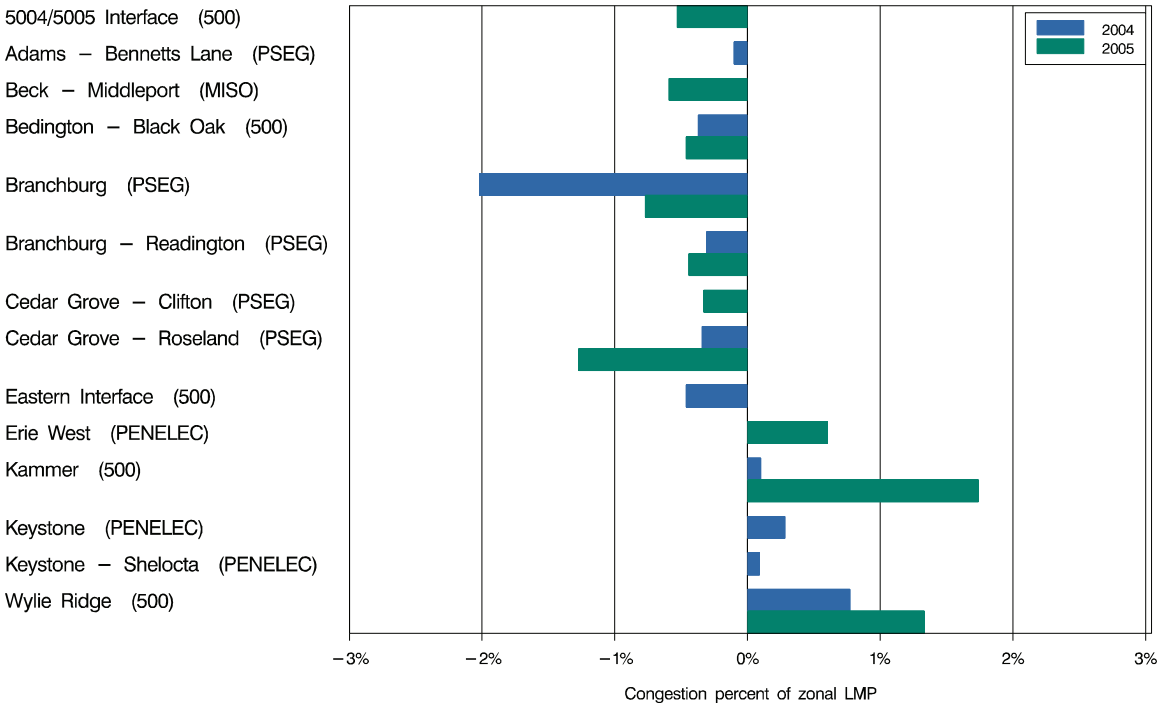


Figure 7-23 shows that the Kammer transformer constraint caused the greatest increase in prices while the Cedar Grove-Roseland constraint caused the greatest decrease in prices in the PENELEC Control Zone.

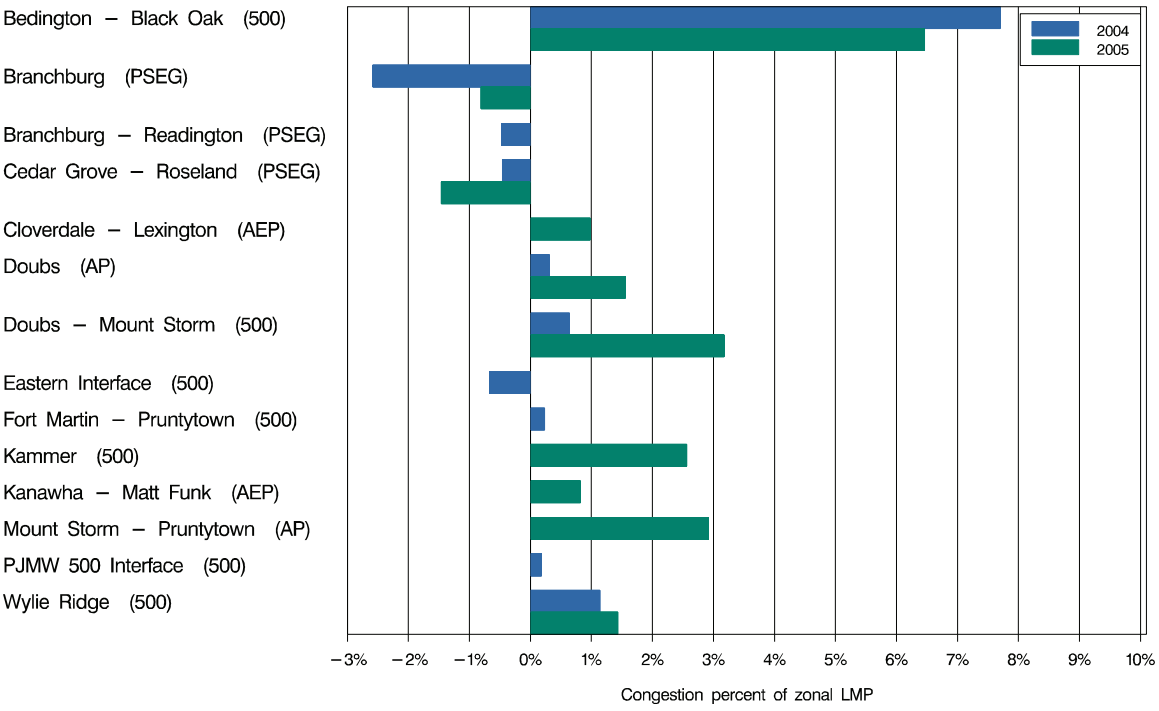
Figure 7-23 - PENELEC Control Zone congestion components: Calendar years 2004 to 2005



PEPCO Control Zone

The PEPCO Control Zone, for which no congestion frequency figure is shown, has experienced very few internal transmission constraints, with one congestion-event hour in 2004 and 32 congestion-event hours in 2005. While the PEPCO zone itself has experienced few internal constraints, PEPCO zonal prices are affected by congestion elsewhere on the system. As Figure 7-24 shows, the Bedington-Black Oak, Doubs-Mount Storm and Mount Storm-Pruntytown constraints caused the greatest increase in prices while the Cedar Grove-Roseland constraint caused the greatest decrease in prices in the PEPCO Control Zone.

Figure 7-24 - PEPCO Control Zone congestion components: Calendar years 2004 to 2005



PPL Control Zone

Figure 7-25 illustrates the frequency of PPL Control Zone constraints. During 2005, the PPL Control Zone experienced 118 congestion-event hours, an increase from the eight congestion-event hours experienced during 2004. The majority of the increase in congestion occurred on the PL North reactive interface. With 81 congestion-event hours, the PL North interface was the most frequently constrained facility in the PPL Control Zone during 2005.

Figure 7-25 - PPL Control Zone congestion-event hours (By facility): Calendar years 2003 to 2005

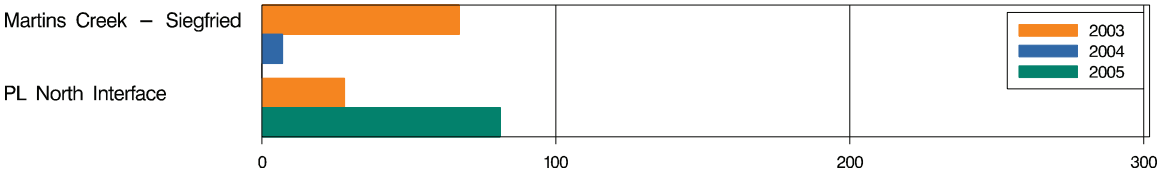
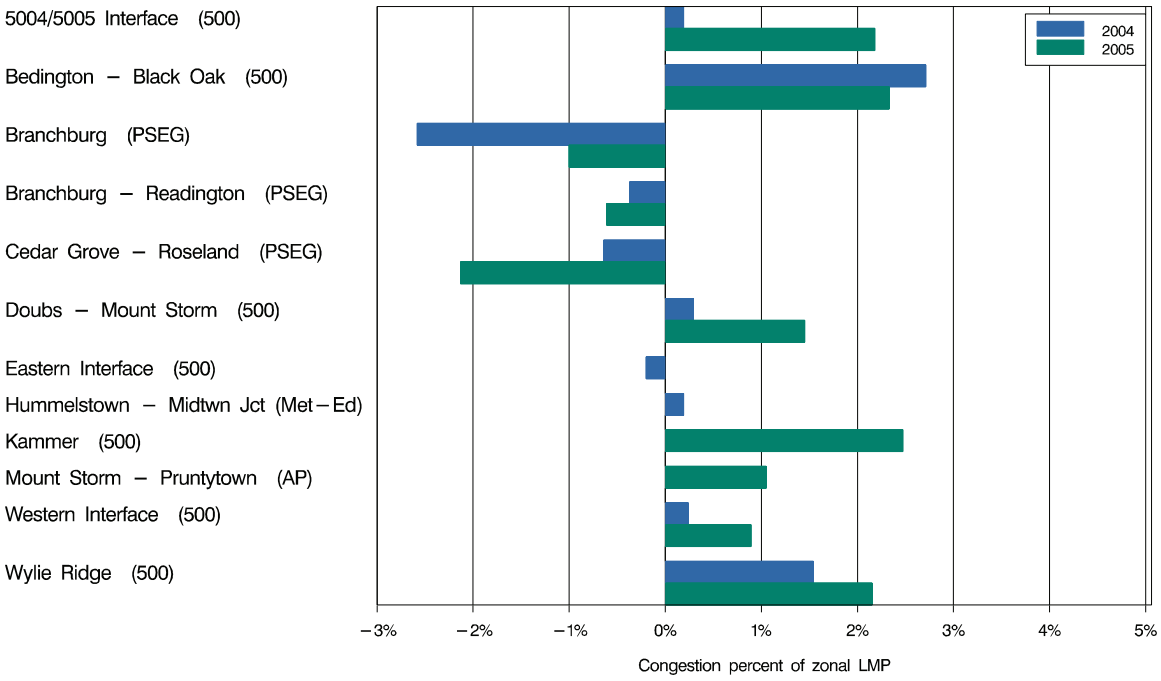


Figure 7-26 shows that the greatest increase in prices in the PPL Control Zone resulted from the Kammer transformer, Bedington-Black Oak, Wylie Ridge transformer and the 5004/5005 interface constraints. The Cedar Grove-Roseland and Branchburg transformer constraints caused the greatest decrease in prices in the PPL Control Zone.

Figure 7-26 - PPL Control Zone congestion components: Calendar years 2004 to 2005



PSEG Control Zone

Figure 7-27 illustrates constraint occurrences in the PSEG Control Zone. Total congestion frequency in PSEG was 7 percent lower with 1,761 congestion-event hours during 2005 versus 1,895 congestion-event hours in 2004. The 412 hours of congestion at Branchburg were down from the 1,005 hours experienced during 2004 and constituted the greatest decrease in congestion frequency of any facility in PJM as compared to 2004. On March 17, 2004, PSEG significantly reduced the emergency and normal ratings of the Branchburg number 1 and number 2 transformers because of a deteriorating condition identified during an inspection. On May 25, 2004, an SPS was implemented at Branchburg to reduce the impact on congestion from the derated facilities. A third transformer was installed at Branchburg on April 25, 2005, to relieve this constraint. Both the Branchburg number 1 and number 2 500/230 kV transformers had previously experienced enough unhedgeable congestion to trigger the opening of a market window. The market windows for each of these facilities closed on May 18, 2005, with both transformers scheduled to be replaced by June 2007. The Cedar Grove-Roseland 230 kV line had 364 congestion-event hours and was the second most frequently constrained facility in the PSEG Control Zone during 2005. Congestion on Cedar Grove-Roseland increased with the installation of a third transformer at Branchburg in April 2005. The rating reduction on the Branchburg transformers previously had the effect of limiting imports into the northern PSEG Control Zone and reduced the loading on this facility. During 2004, Cedar Grove-Roseland had been constrained for 150 hours. The Edison-Meadow Road 138 kV line was constrained for 191 hours in 2005 as compared to 33 hours during 2004. This line had previously incurred sufficient unhedgeable congestion to open a market window which closed on March 4, 2005. PSEG will be upgrading this circuit prior to the summer of 2009 which will increase the facility's rating by 60 percent.

Figure 7-27 - PSEG Control Zone congestion-event hours (By facility): Calendar years 2003 to 2005

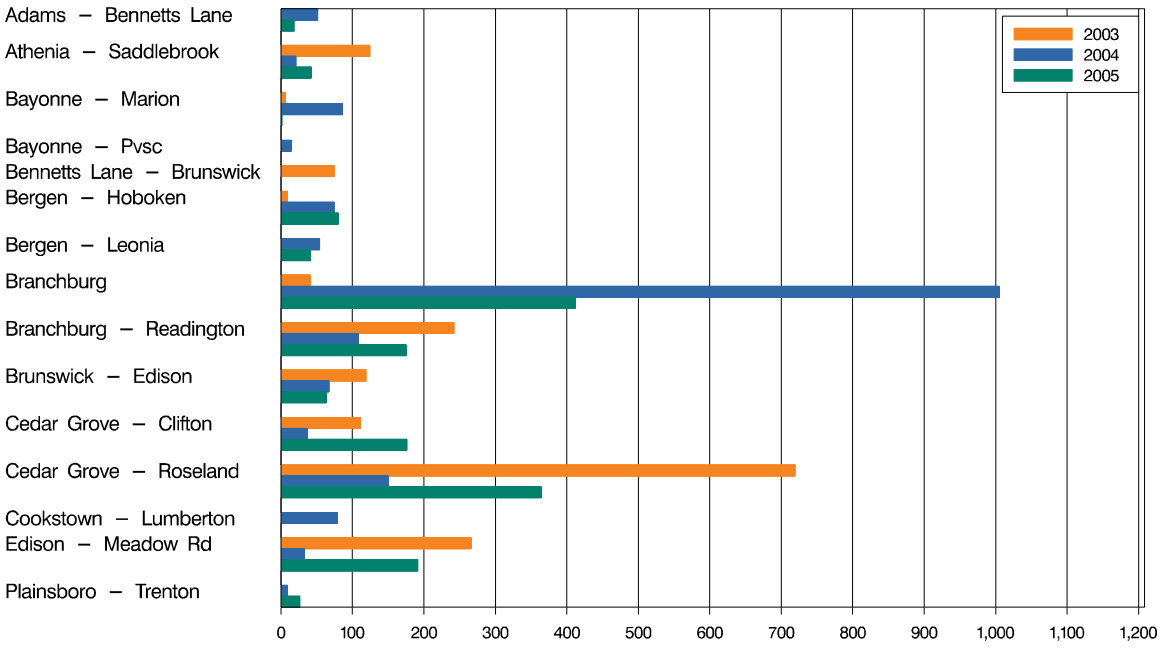
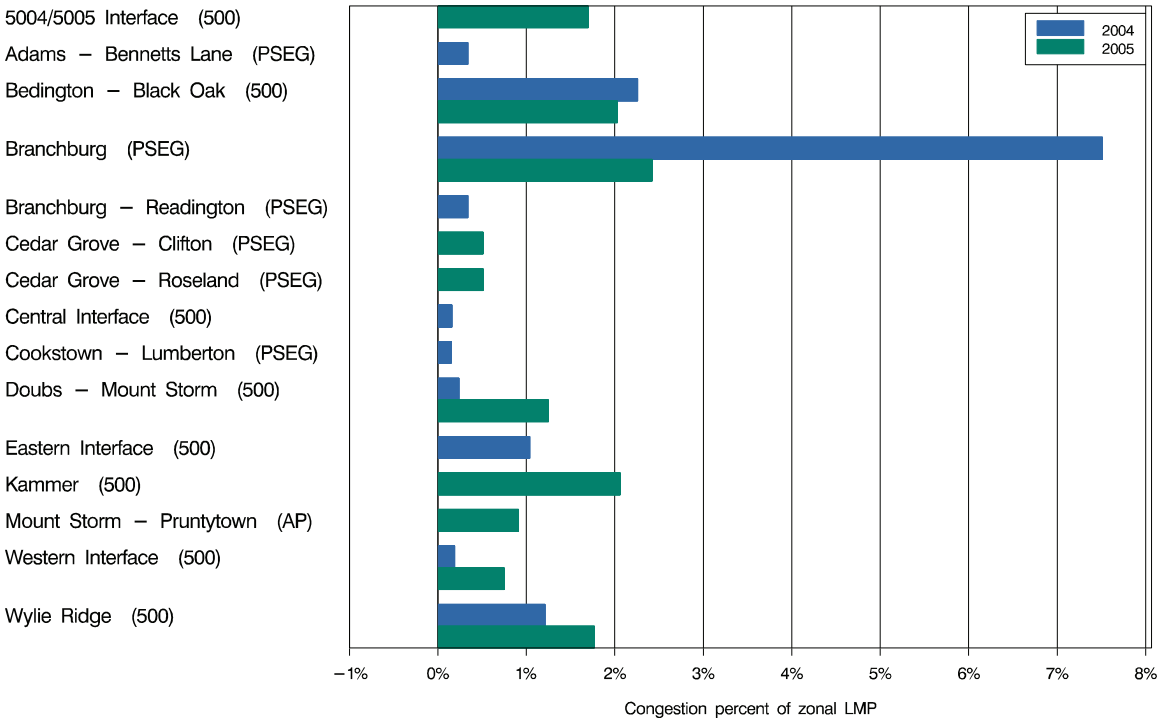


Figure 7-28 shows that the Branchburg transformer, a PSEG Control Zone facility, Bedington-Black Oak and Kammer transformer constraints increased prices in the PSEG Control Zone. There were no constraints that significantly reduced prices in the PSEG Control Zone during 2005.

Figure 7-28 - PSEG Control Zone congestion components: Calendar years 2004 to 2005



Western Region Congestion-Event Hours and Congestion Components

AEP Control Zone

Figure 7-29 illustrates constraint occurrences in the AEP Control Zone. There were 1,901 congestion-event hours in 2005 as compared to the 168 congestion-event hours experienced during the three months following its Phase 3 integration into PJM on October 1, 2004. The Cloverdale-Lexington 500 kV line with 508 congestion-event hours was the most frequently constrained AEP Control Zone facility in 2005. This facility accumulated sufficient unhedgeable congestion to open a market window under the PJM economic planning process on May 5, 2005. This market window is scheduled to close on May 5, 2006. The Mahans Lane-Tidd 138 kV line and the Kanawha-Matt Funk 345 kV line with 448 and 401 congestion-event hours, respectively, were the second and third most frequently constrained facilities in the AEP Control Zone during 2005. These two facilities together with the Cloverdale-Lexington line accounted for 71 percent of all AEP Control Zone congestion during 2005. Before the integration of AEP, congestion on these facilities had been managed through the use of North American Electric Reliability Council (NERC) TLRs. Since then, however, given PJM's reliance on LMP, the impacts of these constraints have become more localized.

Figure 7-29 - AEP Control Zone congestion-event hours (By facility): Phase 3, 2004 to December 31, 2005

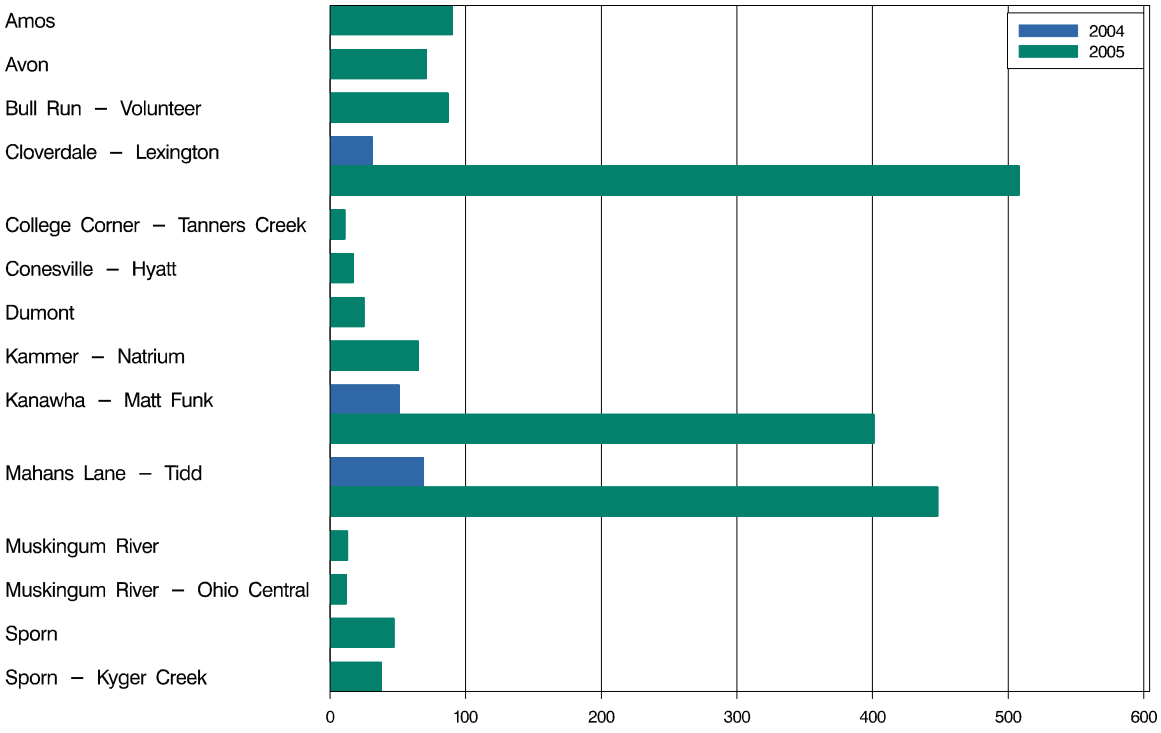
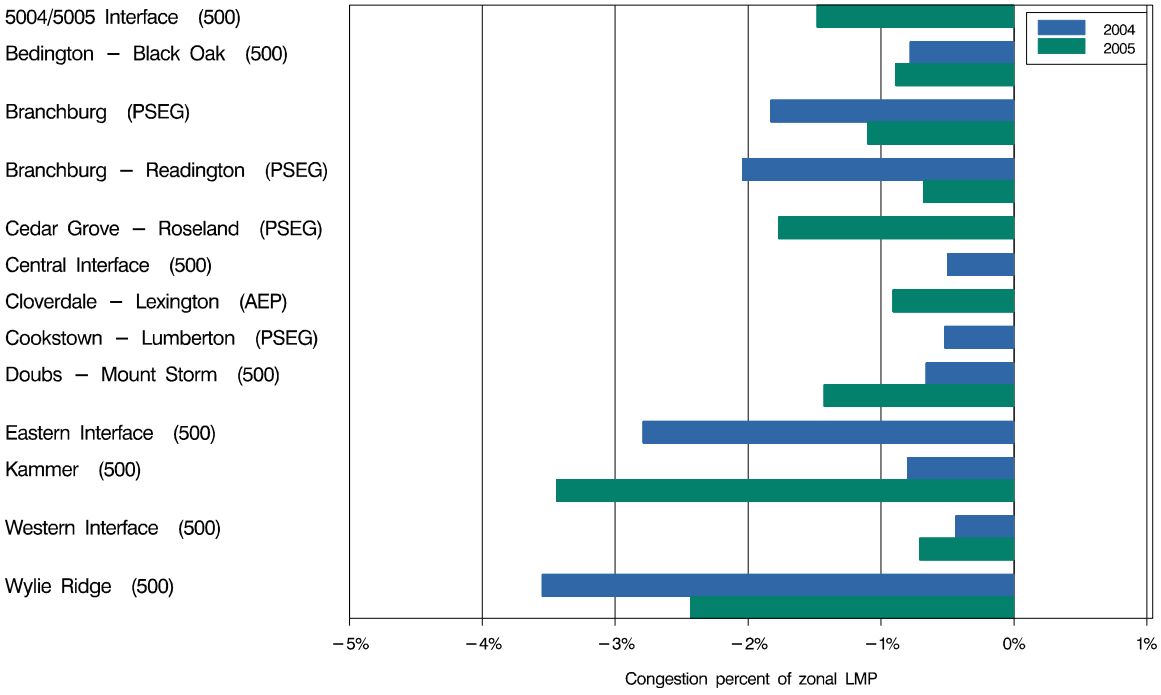


Figure 7-30 shows that the Kammer and Wylie Ridge transformer constraints caused the greatest reduction in prices in the AEP Control Zone. There were no constraints that significantly increased prices in the AEP Control Zone during 2005.

Figure 7-30 - AEP Control Zone congestion components: Phase 3, 2004 to December 31, 2005



AP Control Zone

Figure 7-31 illustrates the AP Control Zone constraints. Congestion in the AP Control Zone increased by 746 percent with 2,877 congestion-event hours during 2005 as compared to 340 congestion-event hours during 2004. Driving this change was an increase in congestion on the Doubs transformers which experienced 441 more congestion-event hours during 2005 than they had in 2004. There were 696 hours of congestion on the Mount Storm-Pruntytown 500 kV line which experienced no congestion during 2004. Together, these two facilities were constrained for 1,222 hours constituting 42 percent of the total AP Control Zone congestion-event hours. Congestion on Mount Storm – Pruntytown began to occur after the May 1, 2005, integration of Dominion. Prior to this, congestion had been managed through the use of TLRs.

Figure 7-31 - AP Control Zone congestion-event hours (By facility): Calendar years 2003 to 2005

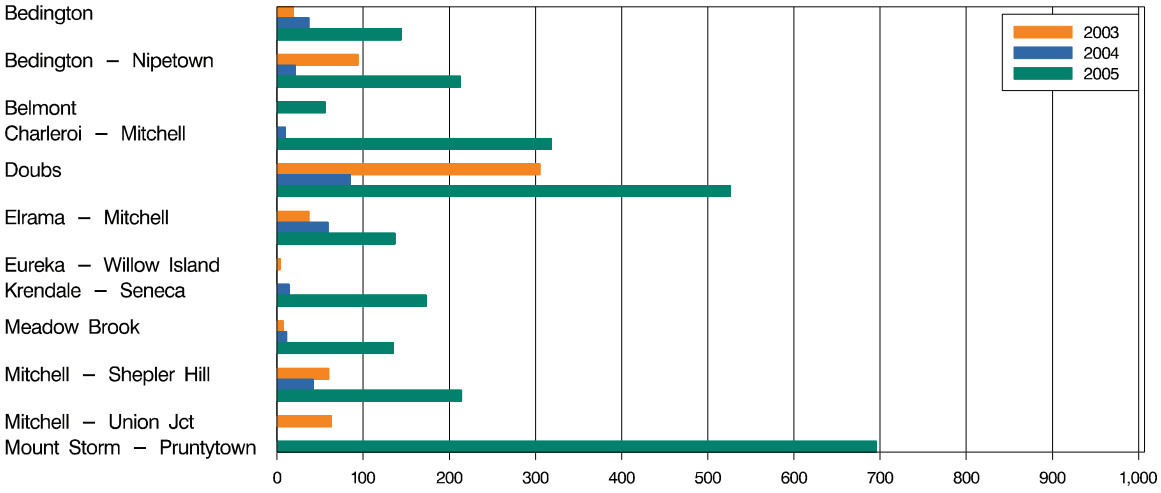
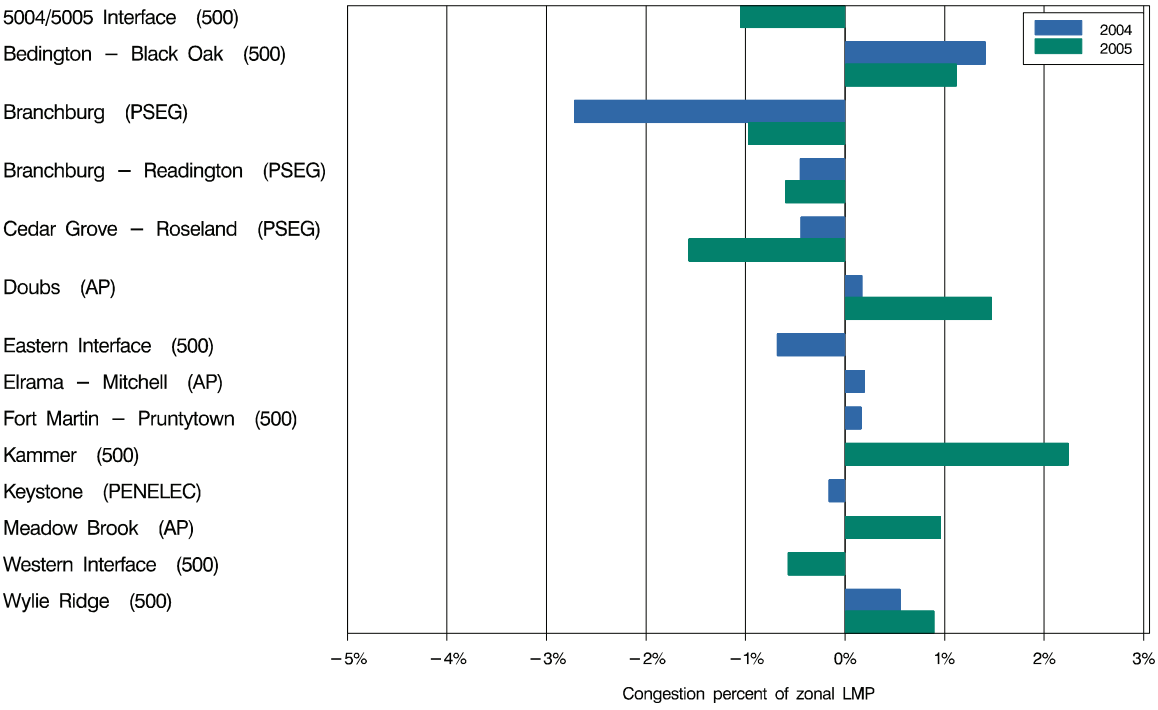


Figure 7-32 shows the congestion components of the AP Control Zone LMP. The Kammer transformer and Doubs transformer constraints caused the greatest increase in prices while the Cedar Grove-Roseland constraint in PSEG caused the greatest decrease in prices in the AP Control Zone.

Figure 7-32 - AP Control Zone congestion components: Calendar years 2004 to 2005



ComEd Control Zone

Figure 7-33 illustrates constraint occurrences in the ComEd Control Zone. There were 517 congestion-event hours in the ComEd Control Zone during 2005. During the eight months following its Phase 2 integration into PJM on May 1, 2004, the ComEd Control Zone experienced 130 congestion-event hours. There was one facility constrained more than 100 hours during 2005, the Cherry Valley 345/138 kV transformer which was constrained for 104 hours. The Waukegan-Round Lake 138 kV line with 79 congestion-event hours was the second most constrained facility in the ComEd Control Zone during 2005. Congestion in the ComEd zone was minimized by post-contingency switching procedures which are employed where PJM would have otherwise initiated out-of-merit dispatch.

Figure 7-33 - ComEd Control Zone congestion-event hours (By facility): Phase 2, 2004 to December 31, 2005

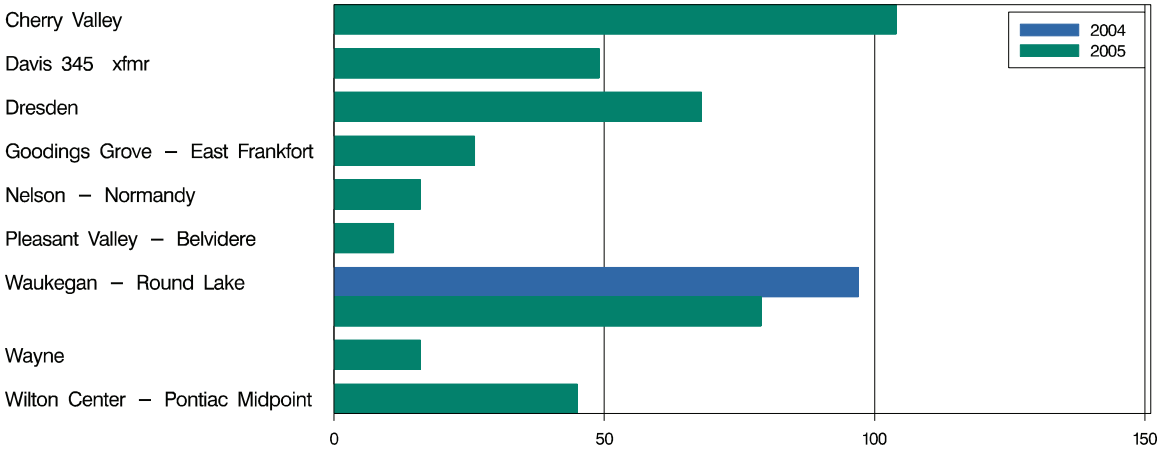
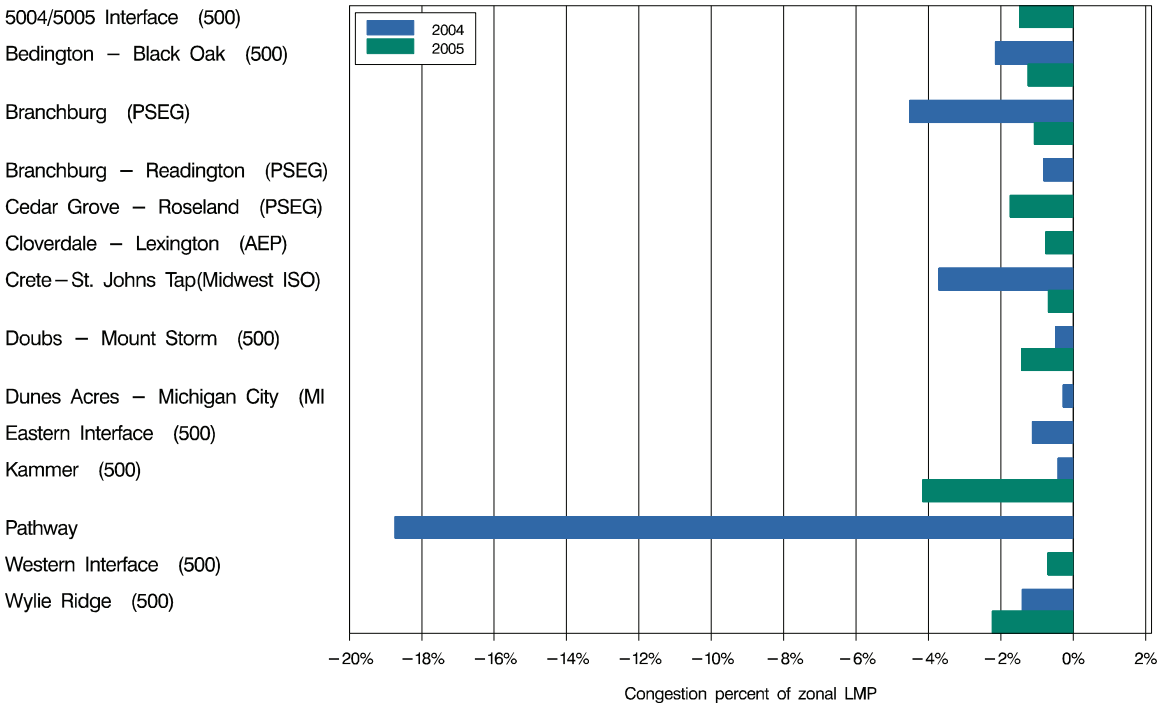


Figure 7-34 depicts congestion components of the ComEd Control Zone LMP during 2005. Constraints on the Kammer and Wylie Ridge transformers reduced prices in the ComEd Control Zone. There were no constraints that significantly increased prices in the ComEd Control Zone during 2005.

Figure 7-34 - ComEd Control Zone congestion components: Phase 2, 2004 to December 31, 2005



DAY Control Zone

Figure 7-35 illustrates constraint occurrences in the DAY Control Zone which has experienced only 73 congestion-event hours during 2005. The DAY Control Zone had experienced 19 congestion-event hours during the three months following its Phase three integration into PJM on October 1, 2004. The Miami Fort transformer was the most frequently constrained facility in the DAY Control Zone during 2005 with 69 congestion-event hours.

Figure 7-35 - DAY Control Zone congestion-event hours (By facility): Phase 3, 2004 to December 31, 2005

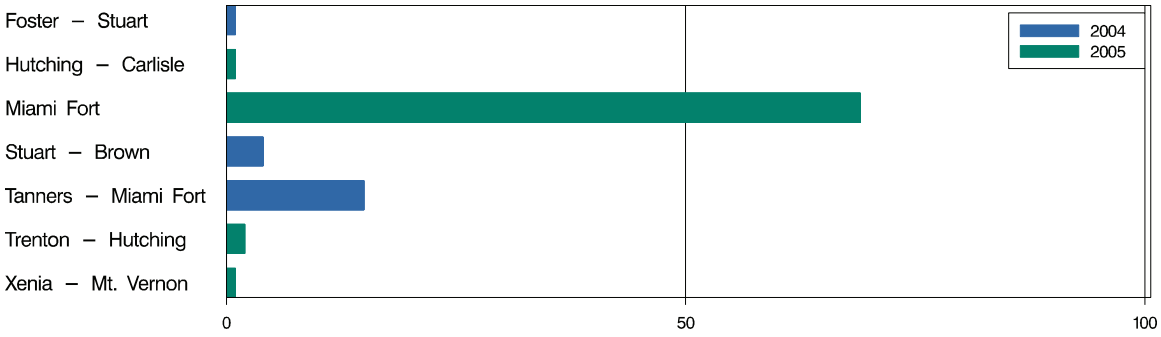
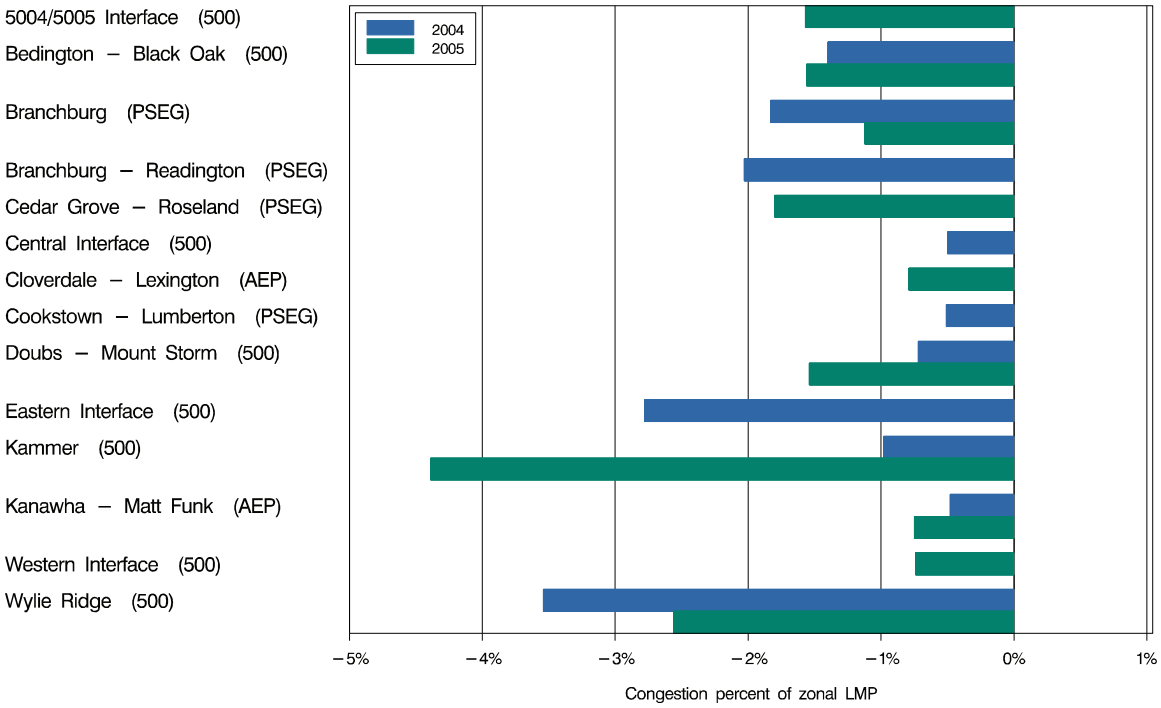


Figure 7-36 shows the congestion components of the DAY Control Zone's LMP. The Kammer and Wylie Ridge and transformer constraints caused the greatest reduction in prices in the DAY Control Zone. There were no constraints that significantly increased prices in the DAY Control Zone during 2005.

Figure 7-36 - DAY Control Zone congestion components: Phase 3, 2004 to December 31, 2005



DLCO Control Zone

Figure 7-37 illustrates constraint occurrences in the DLCO Control Zone. Following its Phase 4 integration into PJM, the DLCO Control Zone experienced 108 congestion-event hours during 2005. No facilities were constrained more than 50 hours in the DLCO Control Zone during 2005. The most frequently occurring constraint in the DLCO Control Zone was the Collier transformer with 44 congestion-event hours during 2005.

Figure 7-37 - DLCO Control Zone congestion-event hours (By facility): Calendar year 2005

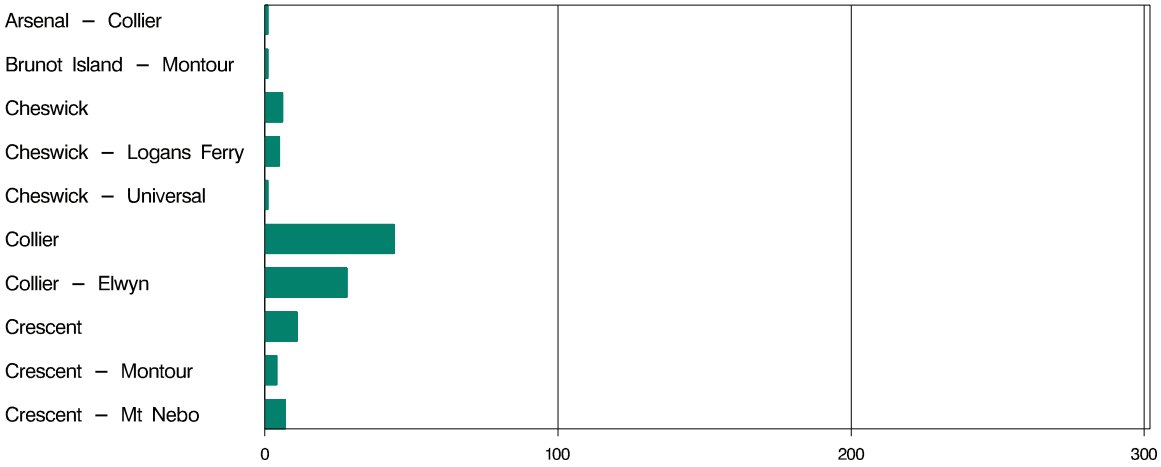
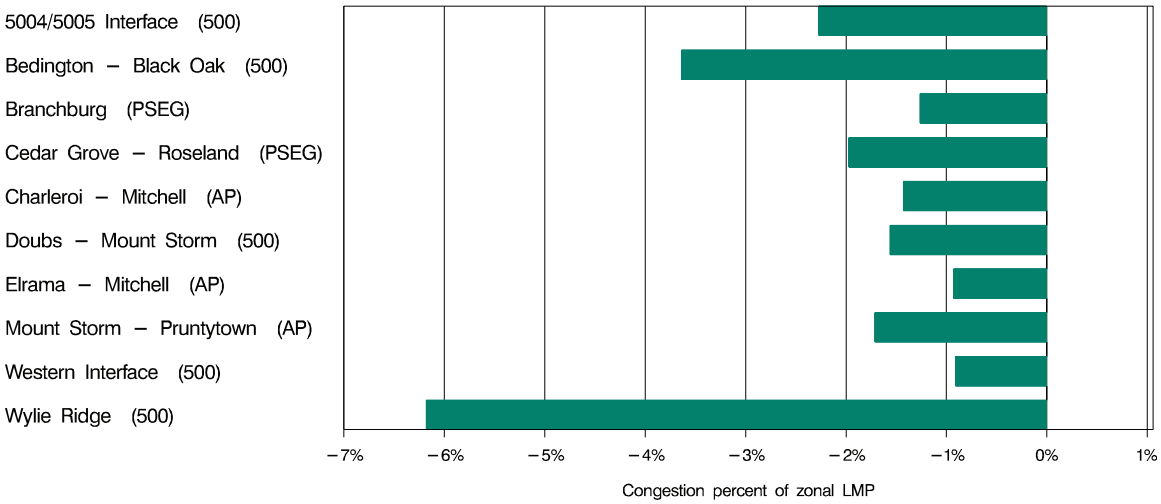


Figure 7-38 depicts the congestion components of the DLCO Control Zone's LMP. The Wylie Ridge transformer and the Bedington-Black Oak constraints caused the greatest reduction in prices in the DLCO Control Zone. There were no constraints that significantly increased prices in the DLCO Control Zone during 2005.

Figure 7-38 - DLCO Control Zone congestion components: Calendar year 2005



Southern Region Congestion-Event Hours and Congestion Components

Dominion Control Zone

Figure 7-39 illustrates constraint occurrences in the Dominion Control Zone. Following its Phase 5 integration into PJM, the Dominion Control Zone experienced 658 congestion-event hours during 2005. The Alta Vista-Dominion 115 kV line was the most frequently constrained facility in the Dominion Control Zone with 173 congestion-event hours. The Beechwood –Kerr Dam 115 kV line was the second most frequently constrained facility in the Dominion Control Zone with 128 congestion-event hours. No other Dominion Control Zone facilities were constrained more than 100 hours.

Figure 7-39 - Dominion Control Zone congestion-event hours (By facility): Phase 5, 2005

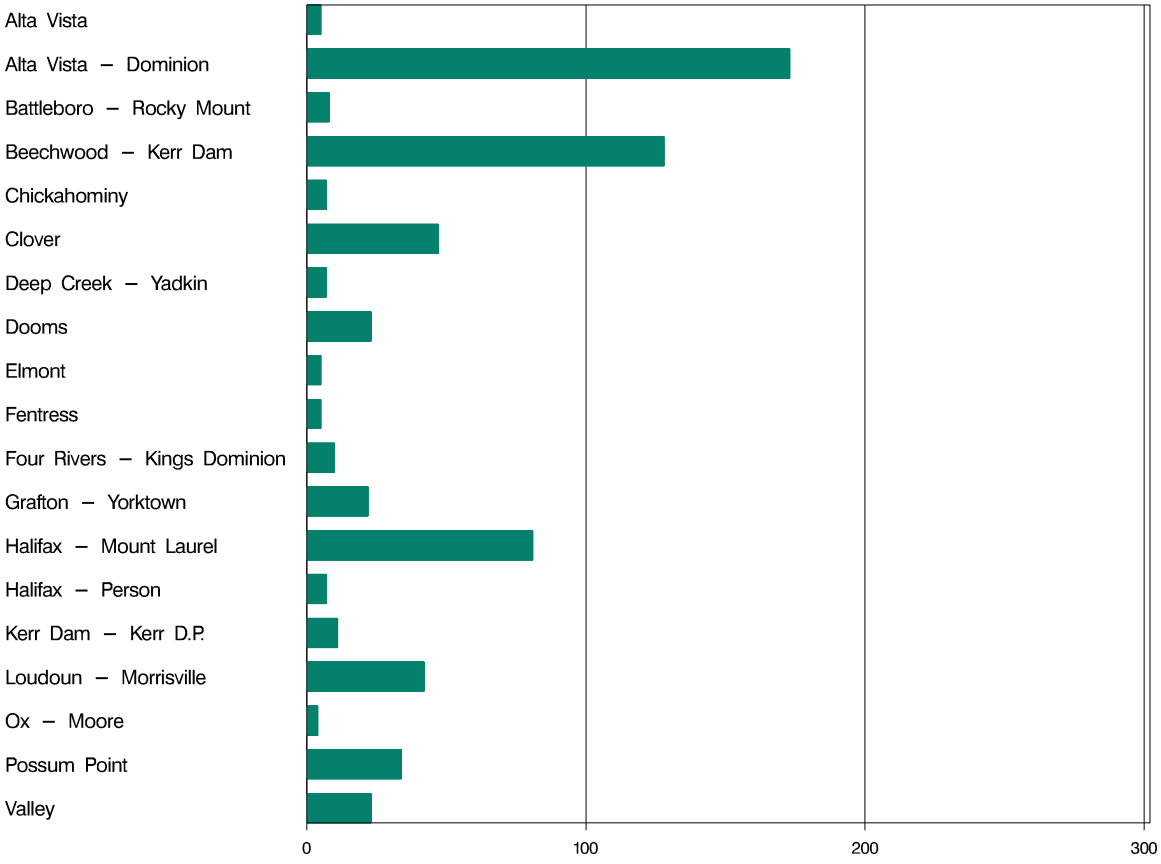


Figure 7-40 depicts the congestion components of the Dominion Control Zone's LMP. The Bedington-Black Oak and Mount Storm-Pruntytown constraints caused the greatest increase in prices in the Dominion Control Zone. The Cedar Grove-Roseland constraint caused the greatest reduction in prices in the Dominion Control Zone in 2005.

Figure 7-40 - Dominion Control Zone congestion components: Phase 5, 2005

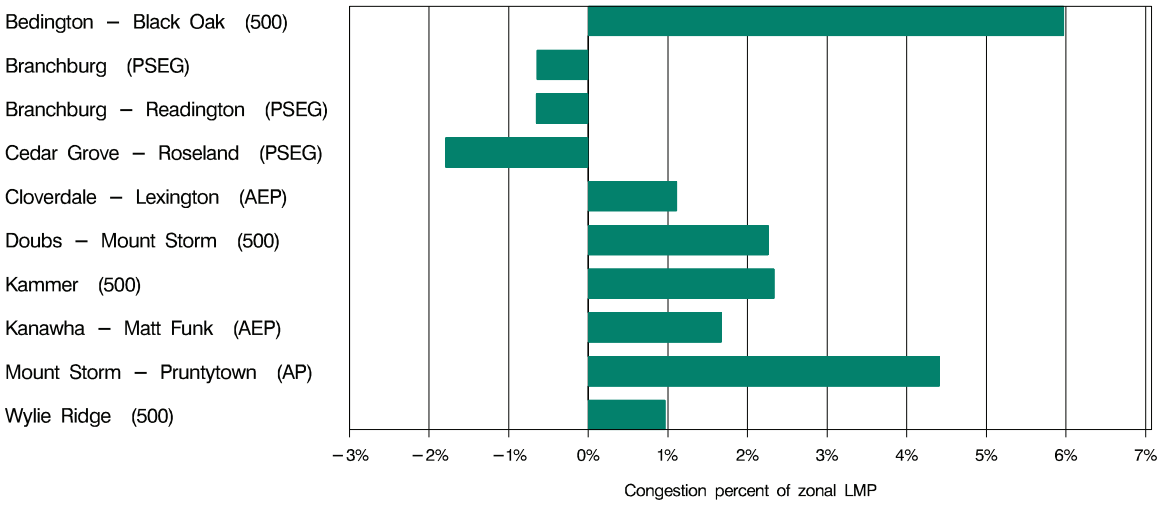


Table 7-7 lists congestion-event hours by facility type and voltage.

Table 7-7 - Congestion-event hour summary (By facility type and voltage class): Calendar years 2002 to 2005

Type	Voltage (kV)	Congestion-Event Hours				% of Congestion-Event Hours			
		2002	2003	2004	2005	2002	2003	2004	2005
All	All	11,662	9,711	*11,205	17,524	100%	100%	100%	100%
	765	-	-	-	16	-	-	-	0%
	500	1,888	1,985	1,809	5,494	16%	20%	16%	31%
	345	1,084	705	1,115	2,214	9%	7%	10%	13%
	230	1,474	3,016	2,340	2,537	13%	31%	21%	14%
	138	2,056	1,071	977	3,741	18%	11%	9%	21%
	115	2,527	1,018	534	1,323	22%	10%	5%	8%
	69	2,619	1,916	1,918	2,199	22%	20%	17%	13%
	34	14	0	0	0	0%	0%	0%	0%
Midwest ISO Flowgate	All	-	-	455	216	-	-	4%	1%
	500	-	-	0	3	-	-	0%	0%
	345	-	-	369	121	-	-	3%	1%
	230	-	-	4	50	-	-	0%	0%
	138	-	-	82	42	-	-	1%	0%
Interface	All	1,683	1,274	1,018	1,463	14%	13%	9%	8%
	500	586	764	397	940	5%	8%	4%	5%
	345	5	0	0	0	0%	0%	0%	0%
	230	388	103	0	81	3%	1%	0%	0%
	115	538	11	16	4	5%	0%	0%	0%
	69	166	396	605	438	1%	4%	5%	2%
Line	All	5,552	5,590	4,622	10,230	48%	58%	41%	58%
	765	-	-	-	16	-	-	-	0%
	500	1,128	917	1,328	3,219	10%	9%	12%	18%
	345	233	168	99	669	2%	2%	1%	4%
	230	658	2,104	996	1,350	6%	22%	9%	8%
	138	1,163	815	756	2,356	10%	8%	7%	13%
	115	413	187	280	1,023	4%	2%	2%	6%
	69	1,943	1,399	1,163	1,597	17%	14%	10%	9%
	34	14	0	0	0	0%	0%	0%	0%
Transformer	All	4,427	2,847	2,598	5,615	38%	29%	23%	32%
	500	174	304	84	1,332	1%	3%	1%	8%
	345	846	537	647	1,424	7%	6%	6%	8%
	230	428	809	1,340	1,056	4%	8%	12%	6%
	138	893	256	139	1,343	8%	3%	1%	8%
	115	1,576	820	238	296	14%	8%	2%	2%
	69	510	121	150	164	4%	1%	1%	1%

*2004 total includes an additional 2,512 congestion-event hours attributable to the Pathway between ComEd and PJM during Phase 2.

Post-Contingency Congestion Management Program

The PJM "Transmission Operations Manual" states in relevant part:

> The PJM [regional transmission organization] RTO Bulk Power Electric Supply System is operated so that loading on all PJM Monitored Bulk Power Transmission Facilities are within normal continuous ratings, and so that immediately following any single facility malfunction or failure, the loading on all remaining facilities can be expected to be within emergency ratings.[20]

PJM developed, tested and implemented a protocol that results in less frequent out-of-merit dispatch than had been the case under the then-current system. On August 19, 2004, the FERC accepted PJM's plan.[21] The program was implemented on September 1, 2004. The FERC noted that the expansion of this program has potential to: reduce redispatch costs in chronically congested areas in the PJM region; more accurately reflect the local benefits of avoided redispatch and enhanced reliability; reduce the potential for the exercise of local market power; reduce emissions; and allow for more efficient use of assets.

Under this post-contingency congestion management protocol, a facility may be operated to a 30-minute, short-term emergency rating if there is sufficient quick start generation capability or switching to respond to the loss of a facility. Members submit facility requests and PJM continues to evaluate candidate facilities for inclusion under this protocol. Beginning on June 1, 2005, there were 36 facilities included in this program, an increase of 21 facilities over the number as of June 1, 2004. During 2005, 136 hours of off-cost operation were avoided through the use of this protocol.

Unhedgeable Congestion and the PJM Economic Planning Process

Persistent congestion in areas within PJM and the overall level of congestion costs suggest the importance of PJM's continuing efforts to improve the sophistication of its congestion analysis.

In an order dated December 19, 2002, granting PJM full RTO status, the FERC directed PJM to revise its RTEP process to "more fully explain [...] how PJM's planning process will identify expansions that are needed to support competition" and to "provide authority for PJM to require upgrades both to ensure system reliability and to support competition."[22]

PJM's economic planning process identifies transmission upgrades needed to address unhedgeable congestion. A one-year market window is opened during which merchant solutions are solicited, through the introduction of incentives and through the posting of relevant market data. If market participants do not propose projects to resolve unhedgeable congestion within an appropriate time period, PJM will define, subject to cost-benefit analysis, transmission solutions to be implemented through the RTEP process.

20 See PJM manual, "Transmission Operations (m03), Revision 12" (October 1, 2004), p. 30.
21 108 FERC ¶ 61,196 (2004).
22 101 FERC ¶ 61,345 (2002).

Unhedgeable congestion is a central concept in defining needed transmission upgrades for implementation by third parties and in determining whether transmission upgrades pass the cost-benefit test required to be implemented via the RTEP process. PJM defines unhedgeable congestion as the cost of congestion attributable to the portion of load affected by a transmission constraint that cannot be supplied by economic local generation or hedged with available FTRs or ARRs.[23, 24]

Economic local generation is defined to be the generation capacity that is online at the time of the constraint and available to constrained bus load at offer prices no greater than the PJM system marginal price, where the PJM system marginal price represents the systemwide unconstrained price of energy. Self-scheduled generators are deemed to have price offers of zero. Units that are running out of economic merit order at an offer-capped price pursuant to Section 6 of Schedule 1 of the Operating Agreement are excluded from economic local generation.[25]

The value of economic local generation as a hedge is not correctly calculated in the current methodology. It is not reasonable to assume, as the current method does, that a local generation owner would enter into a contract at its offer level or the system marginal price rather than at the market-clearing local price reflecting congestion. However, economic local generation would be a hedge if effectively owned by load.

The current methodology overstates the value of economic generation as a congestion hedge unless economic local generation is owned by load. The result of such an overstatement would be to undervalue the cost of unhedgeable congestion and to undervalue transmission upgrades. This, in turn, would lead to economic transmission upgrades being rejected under the cost-benefit calculation when they are actually cost effective.

Constraints with Open Market Window

Table 7-8 identifies the facilities for which a market window has been opened. Depending upon their initiation dates, market windows for some of these facilities closed beginning in March 2005. Proposed solutions may only be designated as a “market solution,” and thus be eligible for expedited processing, following the close of the associated market window and by request of the developer. Since the program’s inception, 74 facilities have had market windows opened with 54 of these closing during 2005.

23 104 FERC ¶ 61,124 (2003).

24 Unhedgeable congestion is calculated on an hourly basis in the manner described by the formula presented in: PJM Interconnection, L.L.C., Compliance Filing, Docket No. RT01-2-005 (August 25, 2003).

25 109 FERC ¶61,067 (2004) at p. 49.

Table 7-8 - Constraints with open market window

One-Year Market Window is Open for the Following Congested Facilities	Market Window Open Date	Market Window Close Date	Location of Facility Based on Transmission Owner Zones	Studies Completed
Adams - Brunswick 230 kV "X-2224"	4-Mar-04	4-Mar-05	PSEG	Yes
Bedington - Black Oak 500 kV (Voltage)	4-Mar-04	4-Mar-05	AP	No
Bedington - Black Oak 500 kV (Thermal)	4-Mar-04	4-Mar-05	AP	Yes
Greystone - Portland 230 kV	4-Mar-04	4-Mar-05	Met-Ed / JCPL	Yes
PJM West 500 kV	4-Mar-04	4-Mar-05	Multiple Zones	Yes
North Wales - Whitpain 230 kV	4-Mar-04	4-Mar-05	PECO	Yes
Eastern Interface	4-Mar-04	4-Mar-05	Multiple Zones	No
Jackson 230/115 kV	4-Mar-04	4-Mar-05	Met-Ed	Yes
Yorkana 230/115 kV	4-Mar-04	4-Mar-05	Met-Ed	Yes
Cedar Grove - Clifton 230 kV "K-2263"	4-Mar-04	4-Mar-05	PSEG	No
Adams - Bennetts Lane 230 kV "X-2224"	4-Mar-04	4-Mar-05	PSEG	Yes
Brunswick - Edison 138 kV	4-Mar-04	4-Mar-05	PSEG	No
Sheildalloy - Vineland 69 kV	4-Mar-04	4-Mar-05	AECO	Yes
Edison - Meadow Road 138 kV "R-1318"	4-Mar-04	4-Mar-05	PSEG	Yes
Elroy - Hosensack 500 kV	4-Mar-04	4-Mar-05	PECO / PPL	Yes
Edgewood - N. Salisbury 69 kV	4-Mar-04	4-Mar-05	DPL	Yes
Cedar Interface	4-Mar-04	4-Mar-05	AECO	Yes
Northern PECO Voltage Interface	4-Mar-04	4-Mar-05	PECO	Yes
Athenia - Saddlebrook 230 kV	4-Mar-04	4-Mar-05	PSEG	Yes
Central Interface	4-Mar-04	4-Mar-05	Multiple Zones	No
Laurel - Woodstown 69 kV	4-Mar-04	4-Mar-05	AECO	Yes
DuPont Seaford - Laurel 69 kV	4-Mar-04	4-Mar-05	DPL	Yes
West Interface	4-Mar-04	4-Mar-05	Multiple Zones	No
Landis - Minotola 69 kV	4-Mar-04	4-Mar-05	AECO	Yes
Sammis - Wylie Ridge 345 kV	4-Mar-04	4-Mar-05	AP	Yes
Lewis - Motts Farm 69 kV	4-Mar-04	4-Mar-05	AECO	Yes
Plymouth Meeting - Whitpain 230 kV "220-14"	4-Mar-04	4-Mar-05	PECO	Yes
Keeney 500/230 kV "AT51"	4-Mar-04	4-Mar-05	DPL	Yes
Plymouth Meeting - Whitpain 230 kV "220-13"	4-Mar-04	4-Mar-05	PECO	Yes
Martins Creek - Morris Park 230 kV	4-Mar-04	4-Mar-05	PPL / JCPL	Yes
Bergen - Leonia 230 kV	1-Apr-04	1-Apr-05	PSEG	Yes
Bergen - Hoboken 230 kV	1-Apr-04	1-Apr-05	PSEG	Yes
Wylie Ridge 500/345 kV #5	1-Apr-04	1-Apr-05	AP	Yes
Kammer - Harrison Tap 500 kV	1-Apr-04	1-Apr-05	AP	No
Branchburg 500/230 kV #1	18-May-04	18-May-05	PSEG	Yes
Branchburg 500/230 kV #2	18-May-04	18-May-05	PSEG	Yes
Wylie Ridge 500/345 kV #7	20-Jul-04	20-Jul-05	AP	Yes
Keeney 500/230 kV "AT50"	20-Jul-04	20-Jul-05	DPL	Yes
Branchburg - Flagtown 230 kV	20-Jul-04	20-Jul-05	PSEG	No
Bayonne - Marion 138 kV	29-Nov-04	29-Nov-05	PSEG	No
Roseland - Whippany 230 kV	29-Nov-04	29-Nov-05	JCPL/PSEG	No
Jackson 230/115 kV "5"	29-Nov-04	29-Nov-05	Met-Ed	No
Glasgow - Mt Pleasant 138 kV	29-Nov-04	29-Nov-05	DPL	No
Richmond - Waneeta 230 kV	29-Nov-04	29-Nov-05	PECO	No
Red Lion 500/230 kV "AT50"	29-Nov-04	29-Nov-05	DPL	No
Doubs - Mt Storm 500 kV	29-Nov-04	29-Nov-05	AP/Dominion	No
Beckett - Paulsboro 69 kV	29-Nov-04	29-Nov-05	AECO	No
Hudson 230/138 kV #2	29-Nov-04	29-Nov-05	PSEG	No
Brunner - Yorkana 230 kV	29-Nov-04	29-Nov-05	PPL/Met-Ed	No
Wye Mills 138/69 kV "AT-2"	29-Nov-04	29-Nov-05	DPL	No
Sickler 230/69 kV #1	29-Nov-04	29-Nov-05	AECO	No
Cedar - Sands Point 69 kV	29-Nov-04	29-Nov-05	AECO	No
Talbot-Trappe 69 kV	29-Nov-04	29-Nov-05	DPL	No
Fort Martin - Pruntytown 500 kV	1-Dec-04	1-Dec-05	AP	No
Edge Moor - Harmony 230 kV	2-Mar-05	2-Mar-06	DPL	No
N Philadelphia - Waneeta 230 kV	2-Mar-05	2-Mar-06	PECO	No
Delco Tap - Mickleton 230 kV	2-Mar-05	2-Mar-06	PECO/AECO	No
Cloverdale - Lexington 500 kV	5-May-05	5-May-06	AEP/Dominion	No
Mt Storm - Pruntytown 500 kV	8-Nov-05	8-Nov-06	AP/Dominion	No
Chickahominy 500/230 kV transformer #1	8-Nov-05	8-Nov-06	Dominion	No
Conastone - Northwest 230 kV "2322"	8-Nov-05	8-Nov-06	BGE	No
Keystone - Juniata 500 kV + Conemaugh - Juniata 500 kV interface	8-Nov-05	8-Nov-06	Multiple Zones	No
Center - Westport 115 kV #2	8-Nov-05	8-Nov-06	BGE	No
Bair - Hill 115 kV	8-Nov-05	8-Nov-06	Med-Ed	No
Absecon - Lewis 69 kV #1	8-Nov-05	8-Nov-06	AECO	No
Cedar - Motts 69 kV #5	8-Nov-05	8-Nov-06	AECO	No
Brunner - West Hempfield 230 kV	8-Nov-05	8-Nov-06	PPL	No
Conastone 500/230 kV #2	20-Dec-05	20-Dec-06	BGE	No
Whitpain 500/230 kV #3	20-Dec-05	20-Dec-06	PECO	No
Possum Point 230/115 kV #9	20-Dec-05	20-Dec-06	Dominion	No
Cheswold - Kent 69 kV	20-Dec-05	20-Dec-06	DPL	No
Higbee - Ontario 69 kV	20-Dec-05	20-Dec-06	AECO	No
Edgemoor 230/138 kV "AT20"	20-Dec-05	20-Dec-06	DPL	No
Northwest - Devon 138 kV "11411"	20-Dec-05	20-Dec-06	ComEd	No