



Market Monitoring Unit

December 31, 2007

William Stephens
Howard Spinner
Cody Walker
Virginia State Corporation Commission
P.O. Box 1197
Richmond, Virginia 23218

Re: Case No. PUE-2000-00550

Dear Messrs. Stephens, Spinner and Walker:

The attached report is provided in accordance with paragraph 9 of the Stipulation in Case No. PUE-2000-00550, as approved August 30, 2004 and as amended September 13, 2006. The associated data files are being provided separately.

Please contact me if you have any questions.

Sincerely,

Joseph E. Bowering
Market Monitor

REPORT TO THE VIRGINIA STATE CORPORATION COMMISSION: Congestion in the AEP Service Territory in Virginia

Overview of Congestion Calculations

This report provides details of congestion associated with American Electric Power's (AEP) service territory within the state of Virginia for the periods of October 1, 2005, to September 30, 2006, and October 1, 2006, to September 30, 2007. Congestion calculations are for the entire territory and not for any specific organization; the total congestion calculations are the sum of all the congestion calculations for the organizations with market activity in the area. The report also includes congestion event hours for the constraints which had the largest impact on congestion charges in AEP, either positive or negative, and the congestion charges associated with each constraint.¹

Total congestion costs are comprised of Implicit Congestion (including Spot Congestion) and Explicit Congestion. Implicit Congestion is the net congestion cost to serve load from generation and contractual energy purchases in a defined area while Spot Congestion is the net congestion cost associated with Spot Market purchases and sales.² Explicit Congestion is the net congestion cost associated with point-to-point energy transactions. Each of these categories of congestion costs are, in turn, comprised of day-ahead and balancing congestion costs. Day-ahead congestion is based solely on day-ahead MW while balancing congestion is based on deviations between the day-ahead and real-time MW.³

Table 1 shows a summary of the congestion charges associated with the Virginia portion of the AEP service territory from October 1, 2005 through September 30, 2007.

¹ Congestion event hours are defined as the sum of all intervals where a transmission constraint is binding. In day ahead, an interval equals one hour. In real time, an interval equals five minutes. Thus, real-time event hours are the number of constrained intervals divided by 12.

² PJM stopped calculating spot congestion effective June 1, 2007. The calculations here follow the PJM method.

³ See Table 16, "Congestion Definitions," for a summary of relevant definitions.

Table 1 AEP Total Day-Ahead and Balancing Congestion Costs.

Period	Total Congestion Costs (in millions)				Total
	State	Zone	Day-Ahead	Balancing	
Oct. 1, 2005 - Sept. 30, 2006	Virginia	AEP	\$31.87	(\$6.81)	\$25.06
Oct. 1, 2006 - Sept. 30, 2007	Virginia	AEP	(\$46.78)	\$1.32	(\$45.46)

Congestion charges can be both positive and negative. When a constraint binds, the price effects of that constraint vary. The unconstrained system marginal price (SMP) is uniform for all areas, while the congestion components of LMP will either be positive or negative in a specific area, meaning that actual LMPs are above or below the SMP. Usually a smaller area affected by the constraint will experience increased prices and the larger unconstrained system will see lower prices. If an area is located upstream from the constrained element, the area will experience negative congestion costs (lower prices) from that constrained element. Conversely, positive congestion costs occur when an area is located downstream from a constrained element. Balancing congestion costs result from load or generation deviations between Day-Ahead and Real-Time markets. If a participant has real-time generation or load that is less than its day-ahead generation or load then the deviation will be negative. For example, if a constraint has a positive congestion component of LMP for a bus where a deviation is negative, negative balancing congestion costs will result. If a participant has real-time generation or load that is greater than its day-ahead generation or load then there will be a positive MW deviation.

Table 2 shows the constraints with the largest impact on congestion costs in AEP from October 1, 2005 – September 30, 2006. There were large positive contributions to congestion from the Bedington – Black Oak Interface, the Axton transformer, and the Kanawha – Matt Funk 765 kV line. Several constraints had large negative contributions to congestion costs in AEP, including the Cedar Grove - Roseland line, the Cloverdale – Lexington 500 kV line and the 5004/5005 Interface.

Table 2 AEP Day-ahead and Balancing Congestion Costs by Constraint (10/1/2005 – 9/30/2006).

Total Congestion Costs by Constraint (in millions)							
Constraint Name	Type	Location	Day-Ahead	Balancing	Total	Day-Ahead Event Hours	Real-Time Event Hours
Kanawha - Matt Funk	Line	AEP	\$35.4	(\$6.5)	\$28.9	2,223	919
Bedington - Black Oak	Interface	500	\$23.2	(\$3.3)	\$19.9	4,004	1,844
Axton	Transformer	AEP	\$10.9	(\$0.3)	\$10.5	172	35
Cedar Grove - Roseland	Line	PSEG	(\$8.8)	\$0.6	(\$8.2)	3,592	598
Cloverdale - Lexington	Line	AEP	(\$7.6)	(\$0.5)	(\$8.1)	1,063	731
5004/5005 Interface	Interface	500	(\$7.7)	\$0.5	(\$7.2)	1,977	343
Mount Storm - Pruntytown	Line	APS	\$5.6	(\$0.3)	\$5.3	723	482
West	Interface	500	(\$5.6)	\$0.7	(\$5.0)	1,305	287
Axton - Jacksons Ferry	Line	AEP	\$4.7	(\$0.1)	\$4.6	283	16
Kammer	Transformer	500	(\$4.4)	(\$0.1)	(\$4.4)	3,034	1,383
Central	Interface	500	(\$3.8)	\$0.0	(\$3.8)	793	17
Alta Vista - Dominion	Line	DOM	\$2.0	\$0.5	\$2.5	577	168
Doubs	Transformer	APS	(\$2.2)	\$0.1	(\$2.1)	588	324
Wylie Ridge	Transformer	APS	(\$2.1)	\$0.2	(\$1.9)	2,522	1,592
Branchburg - Readington	Line	PSEG	(\$2.3)	\$0.7	(\$1.6)	551	295

Table 3 shows the constraints with the largest impact on total congestion costs in AEP from October 1, 2006 – September 30, 2007. The Bedington – Black Oak Interface was the top positive contributor to total congestion costs. The Cloverdale – Lexington 500 kV line was the largest contributor to negative congestion costs.

Table 3 AEP Day-ahead and Balancing Congestion Costs by Constraint (10/1/2006 – 9/30/2007).

Total Congestion Costs by Constraint (in millions)							
Constraint Name	Type	Location	Day-Ahead	Balancing	Total	Day-Ahead Event Hours	Real-Time Event Hours
Cloverdale - Lexington	Line	AEP	(\$36.7)	(\$0.3)	(\$37.0)	1,943	1,851
Bedington - Black Oak	Interface	500	\$15.2	(\$2.8)	\$12.4	2,623	1,741
Branchburg - Readington	Line	PSEG	(\$8.1)	\$2.1	(\$5.9)	710	786
5004/5005 Interface	Interface	500	(\$4.7)	\$0.2	(\$4.5)	1,014	375
Central	Interface	500	(\$3.7)	\$0.0	(\$3.7)	610	18
Axton	Transformer	AEP	\$3.6	\$0.0	\$3.6	223	0
Axton - Jacksons Ferry	Line	AEP	\$2.9	(\$0.1)	\$2.8	307	5
AP South	Interface	500	(\$2.6)	\$0.0	(\$2.6)	370	98
Kammer	Transformer	500	(\$2.4)	(\$0.0)	(\$2.4)	828	607
Danville - East Danville	Line	DOM	(\$2.3)	(\$0.1)	(\$2.4)	668	33
Cedar Grove - Roseland	Line	PSEG	(\$2.3)	\$0.1	(\$2.2)	2,048	145
Wylie Ridge	Transformer	APS	(\$1.9)	\$0.2	(\$1.7)	998	777
West	Interface	500	(\$2.3)	\$0.6	(\$1.7)	295	367
East	Interface	500	(\$1.6)	\$0.0	(\$1.6)	264	5
Meadow Brook	Transformer	APS	(\$0.8)	\$0.1	(\$0.7)	574	229

Table 1, Table 2 and Table 3 provide a summary of the total congestion charges in the Virginia portion of AEP. In order to provide a more detailed explanation of the congestion calculations from which the total congestion charges are derived, each category of congestion is defined and a table of the congestion charges or credits associated with each category is provided.

Net Congestion Bill

The net congestion bill is one component of Implicit Congestion costs and is calculated by subtracting generating congestion credits from load congestion payments. The logic is that increased congestion payments by load are offset by increased congestion revenues to generation, for the area analyzed. This analysis does not explicitly address whether the generation credits and load payments all flow through to customers. Table 4 shows a summary of all load congestion payments and generation congestion credits for the AEP service territory in Virginia.

Table 4 AEP Load Congestion Payments and Generation Congestion Credits.

Period	Load Congestion Payments (in millions)		Generation Congestion Credits (in millions)		Net Congestion Bill (in millions)		
	Day-Ahead	Balancing	Day-Ahead	Balancing	Day-Ahead	Balancing	Total
10/1/2005	\$7.4	\$11.4	(\$22.3)	\$15.0	\$29.7	(\$3.6)	\$26.1
10/1/2006	(\$100.3)	(\$113.1)	(\$44.6)	(\$115.1)	(\$55.8)	\$2.0	(\$53.8)

Load Congestion Payments and Generation Congestion Credits are calculated for both the Day-ahead and Balancing Energy Markets.

- **Day-ahead Load Congestion Payments.** Day-ahead load congestion payments are calculated for all cleared demand, decrement bids, and day-ahead energy sale transactions. (Decrement bids and energy sales can be thought of as scheduled load.) Day-ahead load congestion payments are calculated using load MW and the congestion component of LMP (CLMP) for the load bus, decrement bid location, or the source of the sale transaction, as applicable.
- **Day-ahead Generation Congestion Credits.** Day-ahead generation congestion credits are calculated for all cleared generation and increment offers and day-ahead energy purchase transactions. (Increment offers and energy purchases can be thought of as scheduled generation.) Day-Ahead generation congestion credits are calculated using generation MW and the CLMP for the generator bus, increment offer location, or the sink of the purchase transaction, as applicable.

- **Balancing Load Congestion Payments.** Balancing load congestion payments are calculated for all deviations between a PJM Member’s real-time load and energy sale transactions and their day-ahead cleared demand, decrement bids, and energy sale transactions. Balancing load congestion payments are calculated using MW deviations and the real-time CLMP for each bus where a deviation from a member’s day-ahead scheduled load exists.
- **Balancing Generation Congestion Credits.** Balancing generation congestion credits are calculated for all deviations between a PJM Member’s real-time generation and energy purchase transactions and the day-ahead cleared generation, increment offers and energy purchase transactions. Balancing generation congestion credits are calculated using MW deviations and the real-time CLMP for each bus where a deviation from a member’s day-ahead scheduled generation exists.

Table 5 and Table 6 show the impact of each constraint on load congestion payments and generation congestion credits. From October 1, 2005 through September 30, 2006, Kanawha – Matt Funk and Bedington - Black Oak had the largest impact on congestion payments and congestion credits in the AEP service territory of Virginia. From October 1, 2006 through September 30, 2007, Cloverdale – Lexington had the largest negative impact on load congestion payments and generation congestion credits. Bedington – Black Oak contributed to positive load congestion payments and generation congestion credits.

Table 5 AEP Day-ahead and Balancing Load Congestion Payments and Generation Congestion Credits by Constraint (10/1/2005 – 9/30/2006).

Constraint	Load Congestion Payments		Generation Congestion Credits		Net Congestion Bill		Total
	Day-Ahead	Balancing	Day-Ahead	Balancing	Day-Ahead	Balancing	
Kanawha - Matt Funk	\$43.4	\$50.3	\$9.0	\$53.1	\$34.4	(\$2.8)	\$31.6
Bedington - Black Oak	\$27.1	\$20.8	\$4.7	\$24.1	\$22.5	(\$3.3)	\$19.2
Axton	\$11.0	\$1.3	\$1.7	\$1.6	\$9.3	(\$0.3)	\$9.0
Cedar Grove - Roseland	(\$13.0)	(\$8.4)	(\$4.6)	(\$8.9)	(\$8.4)	\$0.5	(\$7.9)
Cloverdale - Lexington	(\$10.4)	(\$15.9)	(\$2.9)	(\$15.8)	(\$7.6)	(\$0.1)	(\$7.6)
5004/5005 Interface	(\$12.6)	(\$3.6)	(\$5.4)	(\$4.0)	(\$7.2)	\$0.4	(\$6.8)
West	(\$9.3)	(\$4.6)	(\$3.7)	(\$5.2)	(\$5.6)	\$0.6	(\$5.0)
Mount Storm - Pruntytown	\$7.5	\$5.6	\$2.2	\$6.2	\$5.3	(\$0.5)	\$4.8
Kammer	(\$11.7)	(\$10.1)	(\$7.5)	(\$9.8)	(\$4.1)	(\$0.3)	(\$4.5)
Axton - Jacksons Ferry	\$4.8	\$0.4	\$0.5	\$0.5	\$4.2	(\$0.1)	\$4.1
Central	(\$6.1)	(\$0.1)	(\$2.5)	(\$0.2)	(\$3.5)	\$0.0	(\$3.5)
Alta Vista - Dominion	\$2.0	\$4.4	\$0.0	\$3.9	\$2.0	\$0.5	\$2.5
Wylie Ridge	(\$4.4)	(\$5.7)	(\$2.5)	(\$5.6)	(\$1.9)	(\$0.0)	(\$2.0)
Doubs	(\$3.5)	(\$1.0)	(\$1.5)	(\$1.1)	(\$2.0)	\$0.1	(\$2.0)
Branchburg - Readington	(\$3.4)	(\$6.8)	(\$1.0)	(\$7.5)	(\$2.4)	\$0.7	(\$1.7)
AP South	(\$2.9)	(\$2.5)	(\$1.7)	(\$2.3)	(\$1.2)	(\$0.1)	(\$1.3)

Table 6 AEP Day-ahead and Balancing Load Congestion Payments and Generation Congestion Credits by Constraint (10/1/2006 – 9/30/2007).

Constraint	Load Congestion Payments		Generation Congestion Credits		Net Congestion Bill		Total
	Day-Ahead	Balancing	Day-Ahead	Balancing	Day-Ahead	Balancing	
Cloverdale - Lexington	(\$50.7)	(\$61.1)	(\$13.8)	(\$60.6)	(\$36.9)	(\$0.5)	(\$37.4)
Bedington - Black Oak	\$7.5	\$9.7	(\$2.7)	\$12.0	\$10.1	(\$2.3)	\$7.8
Branchburg - Readington	(\$13.9)	(\$20.4)	(\$5.9)	(\$22.6)	(\$8.0)	\$2.1	(\$5.8)
5004/5005 Interface	(\$9.3)	(\$4.0)	(\$4.4)	(\$4.2)	(\$4.9)	\$0.2	(\$4.7)
Central	(\$6.0)	(\$0.1)	(\$2.3)	(\$0.1)	(\$3.7)	\$0.0	(\$3.7)
Kammer	(\$7.3)	(\$7.4)	(\$3.9)	(\$7.4)	(\$3.4)	(\$0.0)	(\$3.4)
Axton	\$3.6	\$0.0	\$0.7	\$0.0	\$3.0	\$0.0	\$3.0
AP South	(\$5.0)	(\$3.5)	(\$2.2)	(\$3.5)	(\$2.8)	\$0.0	(\$2.8)
Axton - Jacksons Ferry	\$2.9	\$0.4	\$0.6	\$0.5	\$2.3	(\$0.1)	\$2.2
Wylie Ridge	(\$4.6)	(\$4.7)	(\$2.1)	(\$4.9)	(\$2.4)	\$0.2	(\$2.2)
Cedar Grove - Roseland	(\$3.8)	(\$1.0)	(\$1.6)	(\$1.1)	(\$2.1)	\$0.1	(\$2.1)
Danville - East Danville	(\$3.0)	(\$1.6)	(\$1.1)	(\$1.5)	(\$1.9)	(\$0.1)	(\$2.0)
West	(\$4.2)	(\$6.0)	(\$1.8)	(\$6.6)	(\$2.3)	\$0.6	(\$1.8)
East	(\$2.8)	(\$0.0)	(\$1.2)	(\$0.0)	(\$1.6)	\$0.0	(\$1.6)
Meadow Brook	(\$1.5)	(\$0.5)	(\$0.7)	(\$0.6)	(\$0.8)	\$0.1	(\$0.7)
Homer City	\$0.9	(\$0.0)	\$0.3	(\$0.0)	\$0.6	(\$0.0)	\$0.6

Spot Market Congestion Costs

Spot Market congestion costs are the second component of Implicit Congestion costs. Spot Market congestion costs are those congestion costs incurred by a PJM member's net Spot Market purchases or sales. Net Spot Market purchases or sales are the difference between a participant's total energy supply (including both generation and contractual energy purchases) and its energy demand (including both load and contractual energy sales). If supply exceeds demand, there is a net Spot Market sale and if demand exceeds supply there is a net Spot Market purchase.

- Day-Ahead Spot Market congestion charges are calculated based on a participant's net Spot Market position in the Day-Ahead Market. If a participant is a net purchaser in an hour then the participant's Spot Market congestion price is a load weighted-average CLMP based on their load position at each bus. There is a load weighted-average CLMP calculated for each constraint. For example, if there are three constraints then there are three unique prices (load weighted-average CLMPs), which when multiplied by the participant's net position and summed will add up to the total Spot Market congestion charges for that participant.
- Day-Ahead Spot Market congestion credits are calculated based on a participant's net Spot Market position in the Day-Ahead Market. If a participant is a net seller in an hour then the participant's Spot Market congestion price is a generation weighted-average CLMP based on their generation position at each

bus. There is a generation weighted-average CLMP calculated for each constraint. For example, if there are three constraints then there are three unique prices (generation weighted-average CLMPs), which when multiplied by the participant's net position and summed will add up to the total Spot Market congestion credits for that participant.

- Balancing Spot Market congestion charges are calculated based on a participant's real-time deviations from their day-ahead net hourly Spot Market purchases. The participant's Spot Market congestion price is based on the load deviation weighted-average CLMP based on their real-time load deviations from day ahead at each bus. If no load deviations exist, the Spot Market congestion price is based on a real-time, load weighted-average CLMP using the participant's real-time load at each bus.
- Balancing Spot Market congestion credits are calculated based on a participant's real-time deviations from their day-ahead, net hourly Spot Market sales. The participant's Spot Market congestion price is based on the generation deviation-weighted CLMP based on their real-time generation deviations from day ahead at each bus. If no generation deviations exist, the Spot Market congestion price is based on a real-time, generation-weighted CLMP using the participant's real-time generation at each bus.

Spot Market Congestion Charges and Spot Market Congestion Credits for the AEP service territory in Virginia are calculated based on each participant's net interchange MW in the Virginia portion of AEP, or the difference between their load and generation in the Virginia portion of AEP. However, the spot market prices used are uniform across all zones and reflect a participant's entire net interchange position in PJM and are not unique to AEP. This is done to be consistent with PJM congestion charges that are calculated on a system-wide basis and not a zonal or state basis.

Total Spot Market Congestion Charges for AEP Virginia are the difference between the sum of all participants' Day-ahead and Balancing Spot Market Congestion Charges and the sum of all participants' Day-ahead and Balancing Spot Market Congestion Credits within the Virginia portion of AEP.

Table 7 shows that the total spot market congestion charges in AEP Virginia for both periods.

Table 7 AEP Total Spot Market Congestion Costs.

Spot Market Congestion Costs (in millions)			
Period Beginning	Day-Ahead	Balancing	Total
10/1/2005	(\$94.9)	\$8.4	(\$86.5)
10/1/2006	(\$99.6)	\$10.2	(\$89.5)

Table 8 and Table 9 show that the Kammer Transformer was the largest contributor to Spot Congestion Costs in AEP Virginia from October 1, 2005 through September 30, 2006 and that Bedington – Black Oak was the largest contributor to Spot Congestion Costs from October 1, 2006 through September 30, 2007.

Table 8 AEP Spot Market Congestion Costs by Constraint (10/1/2005 – 9/30/2006).

Spot Market Congestion Costs (in millions)			
Constraint	Day-Ahead	Balancing	Total
Kammer	(\$18.9)	\$1.2	(\$17.7)
5004/5005 Interface	(\$10.2)	\$0.6	(\$9.6)
Bedington - Black Oak	(\$8.7)	\$0.5	(\$8.2)
Cedar Grove - Roseland	(\$8.0)	\$0.5	(\$7.5)
Wylie Ridge	(\$7.6)	\$1.1	(\$6.5)
West	(\$6.4)	\$0.8	(\$5.7)
Cloverdale - Lexington	(\$3.7)	\$0.1	(\$3.6)
Central	(\$3.4)	\$0.0	(\$3.4)
Kanawha - Matt Funk	(\$2.9)	(\$0.2)	(\$3.2)
Doubs	(\$2.3)	\$0.1	(\$2.3)
AP South	(\$2.7)	\$0.5	(\$2.2)
Doubs - Mount Storm	(\$2.6)	\$0.6	(\$2.0)
Branchburg - Readington	(\$2.2)	\$0.6	(\$1.6)
Mount Storm - Pruntytown	(\$1.6)	\$0.1	(\$1.5)
Meadow Brook	(\$1.4)	(\$0.1)	(\$1.5)
Bedington	(\$1.1)	\$0.0	(\$1.1)

Table 9 AEP Spot Market Congestion Costs by Constraint (10/1/2006 – 9/30/2007).

Spot Market Congestion Costs (in millions)			
Constraint	Day-Ahead	Balancing	Total
Bedington - Black Oak	(\$25.4)	\$1.2	(\$24.2)
Cloverdale - Lexington	(\$19.2)	\$1.8	(\$17.4)
Wylie Ridge	(\$8.1)	\$1.1	(\$7.0)
Kammer	(\$7.8)	\$1.1	(\$6.7)
5004/5005 Interface	(\$6.5)	\$0.3	(\$6.2)
Branchburg - Readington	(\$7.6)	\$2.1	(\$5.5)
AP South	(\$4.1)	\$0.2	(\$3.9)
Central	(\$3.6)	(\$0.0)	(\$3.6)
Bedington	(\$2.8)	\$0.0	(\$2.7)
Cedar Grove - Roseland	(\$2.0)	\$0.1	(\$1.9)
West	(\$2.6)	\$0.9	(\$1.7)
East	(\$1.6)	\$0.0	(\$1.6)
Meadow Brook	(\$1.3)	\$0.1	(\$1.2)
Elrama - Mitchell	(\$1.1)	\$0.1	(\$1.0)
Danville - East Danville	(\$0.7)	\$0.0	(\$0.7)
Axton	(\$0.7)	\$0.0	(\$0.7)

Implicit Congestion Costs

Implicit Congestion costs are the congestion costs for moving generation to load across a constrained system. Implicit Congestion costs are derived by calculating an hourly net congestion bill for each market participant and subtracting their Spot Market congestion costs. Implicit Congestion costs equal the net congestion bill minus Spot Market congestion costs. If a participant has no Spot Market net interchange, then the Implicit Congestion costs will equal the net congestion bill for that participant.

The Total Implicit Congestion Charges calculated for the Virginia portion of AEP represent the sum of all congestion charges associated with each participant's load and generation located within Virginia and AEP (net congestion bill) minus the sum of all congestion costs associated with each participant's spot purchases and spot sales located within Virginia and AEP.

Table 10 shows total implicit congestion charges decreased by 75 million dollars from the period beginning October 1, 2005 to the period beginning October 1, 2006.

Table 10 AEP Total Implicit Congestion Costs.

Implicit Congestion Costs (in millions)			
Period Beginning	Day-Ahead	Balancing	Total
10/1/2005	\$124.6	(\$12.0)	\$112.6
10/1/2006	\$45.6	(\$7.6)	\$38.0

Table 11 showed a significant decrease in implicit congestion costs from the Kanawha – Matt Funk line. The Kanawha – Matt Funk congestion decreased from 34.8 million dollars to just under 0.5 million dollars from the period beginning October 1, 2005 to the period beginning October 1, 2006. From October 1, 2006 through September 30, 2007, there was a large negative contribution from the Cloverdale – Lexington 500 kV line on Implicit Congestion costs.

Table 11 AEP Implicit Congestion Costs by Constraint (10/1/2005 – 9/30/2006).

Implicit Congestion Costs (in millions)			
Constraint	Day-Ahead	Balancing	Total
Kanawha - Matt Funk	\$37.4	(\$2.5)	\$34.8
Bedington - Black Oak	\$31.2	(\$3.8)	\$27.3
Kammer	\$14.8	(\$1.5)	\$13.2
Axton	\$10.0	(\$0.3)	\$9.7
Mount Storm - Pruntytown	\$6.9	(\$0.6)	\$6.4
Wylie Ridge	\$5.7	(\$1.2)	\$4.5
Axton - Jacksons Ferry	\$4.4	(\$0.1)	\$4.3
Cloverdale - Lexington	(\$3.8)	(\$0.2)	(\$4.0)
5004/5005 Interface	\$3.0	(\$0.2)	\$2.8
Alta Vista - Dominion	\$1.9	\$0.5	\$2.4
Bedington	\$1.7	(\$0.2)	\$1.5
Cloverdale - Joshua Falls	\$1.7	(\$0.3)	\$1.3
Joshua Falls	\$1.4	(\$0.1)	\$1.3
Doubs - Mount Storm	\$1.7	(\$0.6)	\$1.1
AP South	\$1.6	(\$0.6)	\$0.9
Meadow Brook	\$0.7	\$0.1	\$0.8

Table 12 AEP Implicit Congestion Costs by Constraint (10/1/2006 – 9/30/2007).

Constraint	Implicit Congestion Costs (in millions)		
	Day-Ahead	Balancing	Total
Bedington - Black Oak	\$35.7	(\$2.7)	\$33.0
Cloverdale - Lexington	(\$16.6)	(\$1.6)	(\$18.2)
Wylie Ridge	\$5.7	(\$0.9)	\$4.8
Kammer	\$4.7	(\$1.2)	\$3.5
Axton	\$3.5	\$0.0	\$3.5
Axton - Jacksons Ferry	\$2.8	\$0.0	\$2.8
Bedington	\$2.5	(\$0.1)	\$2.5
5004/5005 Interface	\$1.6	(\$0.1)	\$1.5
AP South	\$1.2	(\$0.1)	\$1.1
Danville - East Danville	(\$1.1)	\$0.0	(\$1.1)
Elrama - Mitchell	\$0.7	(\$0.1)	\$0.7
Mount Storm - Pruntytown	\$0.8	(\$0.2)	\$0.6
Kanawha - Matt Funk	\$0.4	\$0.1	\$0.5
Amos	\$0.4	\$0.0	\$0.5
Mahans Lane - Tidd	\$0.6	(\$0.2)	\$0.4
Meadow Brook	\$0.5	(\$0.1)	\$0.4

Explicit Congestion Costs

Explicit Congestion costs are the congestion costs associated with moving energy from one specific point to another across the transmission system. Point-to-point transactions may be either internal to PJM or be import or export transactions. Explicit Congestion charges equal the difference between source and sink CLMPs for a point-to-point transaction.

- Internal Purchases – For internal purchases the Explicit Congestion charges are calculated based on the difference in CLMPs between the sink bus and source bus of the purchase.
- Import & Export Transactions – For point-to-point and network secondary transmission customers, the Explicit Congestion charges are calculated based on the difference between source and sink CLMP, specific to each constraint.

The Explicit Congestion Costs calculated for the Virginia portion of AEP represent the costs associated with point to point transactions that sink into the Virginia portion of AEP. For example, if a transaction is sourced in Pennsylvania and sinks into AEP Virginia, the charges would be based on the MW of the transaction multiplied by the difference between the sink CLMP and the source CLMP. When calculated using this method, all congestion is allocated to the zone and state of the sink location.

Table 13 shows an increase in Explicit Congestion from the period beginning October 2005 to the period beginning October 2006. .

Table 13 AEP Total Explicit Congestion Costs.

Explicit Congestion Costs (in millions)			
Beginning	Day-Ahead	Balancing	Total
10/1/2005	\$2.1	(\$3.2)	(\$1.1)
10/1/2006	\$7.3	(\$0.6)	\$6.7

Table 14 and Table 15 show a breakdown of the explicit congestion costs by constraint.

Table 14 Dominion Explicit Congestion Costs by Constraint (10/1/2005– 9/30/2006).

Explicit Congestion Costs (in millions)			
Constraint	Day-Ahead	Balancing	Total
Kanawha - Matt Funk	\$1.0	(\$3.7)	(\$2.7)
Axton	\$1.6	(\$0.0)	\$1.6
Bedington - Black Oak	\$0.7	\$0.0	\$0.7
Unclassified	\$0.5	(\$0.0)	\$0.5
Axton - Jacksons Ferry	\$0.5	\$0.0	\$0.5
5004/5005 Interface	(\$0.5)	\$0.0	(\$0.4)
Cloverdale - Lexington	(\$0.0)	(\$0.4)	(\$0.4)
Mount Storm - Pruntytown	\$0.3	\$0.2	\$0.4
Central	(\$0.3)	\$0.0	(\$0.3)
Cedar Grove - Roseland	(\$0.3)	\$0.1	(\$0.3)
Meadow Brook	(\$0.2)	(\$0.0)	(\$0.2)
Doubs	(\$0.2)	\$0.0	(\$0.2)
Danville - East Danville	(\$0.1)	(\$0.0)	(\$0.1)
AP South	(\$0.2)	\$0.1	(\$0.1)
Cloverdale - Joshua Falls	\$0.1	(\$0.0)	\$0.1
Branchburg	(\$0.0)	\$0.1	\$0.1

Table 15 AEP Explicit Congestion Costs by Constraint (10/1/2006 – 9/30/2007).

Explicit Congestion Costs (in millions)			
Constraint	Day-Ahead	Balancing	Total
Bedington - Black Oak	\$5.0	(\$0.5)	\$4.5
Cloverdale - Lexington	(\$1.0)	\$0.2	(\$0.8)
Axton	\$0.8	\$0.0	\$0.8
Kammer	\$0.7	\$0.0	\$0.7
Axton - Jacksons Ferry	\$0.6	(\$0.0)	\$0.6
Danville - East Danville	(\$0.5)	\$0.0	(\$0.5)
Wylie Ridge	\$0.5	(\$0.0)	\$0.5
Bedington	\$0.3	(\$0.0)	\$0.3
AP South	\$0.2	(\$0.0)	\$0.2
5004/5005 Interface	\$0.2	(\$0.0)	\$0.2
Kanawha - Matt Funk	\$0.1	(\$0.2)	(\$0.2)
Mount Storm - Pruntytown	\$0.1	(\$0.0)	\$0.1
Amos	(\$0.1)	\$0.0	(\$0.1)
Elrama - Mitchell	\$0.1	(\$0.0)	\$0.1
Branchburg - Readington	(\$0.1)	\$0.0	(\$0.1)
Beechwood - Kerr Dam	(\$0.1)	\$0.0	(\$0.1)

Total Congestion Costs

Table 16, Table 17 and

Total Congestion Cost by Category (in millions)				
Constraint	Implicit Congestion Charges	Spot Congestion Charges	Explicit Congestion Charges	Total Congestion Charges
Cloverdale - Lexington	(\$4.0)	(\$3.6)	(\$0.4)	(\$8.1)
Bedington - Black Oak	\$27.3	(\$8.2)	\$0.7	\$19.9
Branchburg - Readington	(\$0.1)	(\$1.6)	\$0.0	(\$1.6)
5004/5005 Interface	\$2.8	(\$9.6)	(\$0.4)	(\$7.2)
Central	(\$0.1)	(\$3.4)	(\$0.3)	(\$3.8)
Axton	\$9.7	(\$0.7)	\$1.6	\$10.5
Axton - Jacksons Ferry	\$4.3	(\$0.1)	\$0.5	\$4.6
AP South	\$0.9	(\$2.2)	(\$0.1)	(\$1.5)
Kammer	\$13.2	(\$17.7)	\$0.0	(\$4.4)
Danville - East Danville	(\$0.1)	(\$0.3)	(\$0.1)	(\$0.5)
Cedar Grove - Roseland	(\$0.4)	(\$7.5)	(\$0.3)	(\$8.2)
Wylie Ridge	\$4.5	(\$6.5)	\$0.0	(\$1.9)
East	(\$0.0)	(\$0.5)	(\$0.0)	(\$0.6)
West	\$0.7	(\$5.7)	(\$0.0)	(\$5.0)
Meadow Brook	\$0.8	(\$1.5)	(\$0.2)	(\$0.9)
Kanawha - Matt Funk	\$34.8	(\$3.2)	(\$2.7)	\$28.9

Table 18 present data on total congestion costs by category.

Table 16 AEP Total Congestion Costs by Category

Total Congestion Costs by Category (in millions)					
Period	Implicit Congestion Charges	Spot Congestion Charges	Explicit Congestion Charges	Total Congestion Charges	
10/1/2005	\$ 112.6	\$ (86.5)	\$ (1.1)	\$ 25.1	
10/1/2006	\$ 38.0	\$ (89.5)	\$ 6.7	\$ (44.8)	
Difference	\$ (74.7)	\$ (2.9)	\$ 7.7	\$ (69.9)	

Table 17 AEP Total Congestion Costs by Category and Constraint (10/1/2005 – 9/30/2006)

Total Congestion Cost by Category (in millions)				
Constraint	Implicit Congestion Charges	Spot Congestion Charges	Explicit Congestion Charges	Total Congestion Charges
Cloverdale - Lexington	(\$4.0)	(\$3.6)	(\$0.4)	(\$8.1)
Bedington - Black Oak	\$27.3	(\$8.2)	\$0.7	\$19.9
Branchburg - Readington	(\$0.1)	(\$1.6)	\$0.0	(\$1.6)
5004/5005 Interface	\$2.8	(\$9.6)	(\$0.4)	(\$7.2)
Central	(\$0.1)	(\$3.4)	(\$0.3)	(\$3.8)
Axton	\$9.7	(\$0.7)	\$1.6	\$10.5
Axton - Jacksons Ferry	\$4.3	(\$0.1)	\$0.5	\$4.6
AP South	\$0.9	(\$2.2)	(\$0.1)	(\$1.5)
Kammer	\$13.2	(\$17.7)	\$0.0	(\$4.4)
Danville - East Danville	(\$0.1)	(\$0.3)	(\$0.1)	(\$0.5)
Cedar Grove - Roseland	(\$0.4)	(\$7.5)	(\$0.3)	(\$8.2)
Wylie Ridge	\$4.5	(\$6.5)	\$0.0	(\$1.9)
East	(\$0.0)	(\$0.5)	(\$0.0)	(\$0.6)
West	\$0.7	(\$5.7)	(\$0.0)	(\$5.0)
Meadow Brook	\$0.8	(\$1.5)	(\$0.2)	(\$0.9)
Kanawha - Matt Funk	\$34.8	(\$3.2)	(\$2.7)	\$28.9

Table 18 AEP Total Congestion Costs by Category and Constraint (10/1/2006 – 9/30/2007)

Total Congestion Cost by Category (in millions)				
Constraint	Implicit Congestion Charges	Spot Congestion Charges	Explicit Congestion Charges	Total Congestion Charges
Cloverdale - Lexington	(\$18.2)	(\$17.4)	(\$0.8)	(\$36.4)
Bedington - Black Oak	\$33.0	(\$24.2)	\$4.5	\$13.3
Branchburg - Readington	(\$0.3)	(\$5.5)	(\$0.1)	(\$5.9)
5004/5005 Interface	\$1.5	(\$6.2)	\$0.2	(\$4.6)
Central	(\$0.1)	(\$3.6)	(\$0.0)	(\$3.7)
Axton	\$3.5	(\$0.7)	\$0.8	\$3.6
Axton - Jacksons Ferry	\$2.8	(\$0.6)	\$0.6	\$2.9
AP South	\$1.1	(\$3.9)	\$0.2	(\$2.6)
Kammer	\$3.5	(\$6.7)	\$0.7	(\$2.4)
Danville - East Danville	(\$1.1)	(\$0.7)	(\$0.5)	(\$2.3)
Cedar Grove - Roseland	(\$0.2)	(\$1.9)	(\$0.0)	(\$2.2)
Wylie Ridge	\$4.8	(\$7.0)	\$0.5	(\$1.8)
West	(\$0.0)	(\$1.7)	\$0.0	(\$1.7)
East	(\$0.1)	(\$1.6)	(\$0.0)	(\$1.6)
Meadow Brook	\$0.4	(\$1.2)	\$0.0	(\$0.7)
Kanawha - Matt Funk	\$0.5	(\$0.1)	(\$0.2)	\$0.3

Table 19 shows the difference in total congestion costs by category. Congestion costs resulting from the Kanawha – Matt Funk line decreased 28.7 million dollars and congestion costs resulting from the Cloverdale – Lexington 500 kV line decreased by 28.3 million dollars..

Table 19 Difference in Total Congestion Costs by Category and Constraint for AEP.

Difference in Total Congestion Costs by Category (in millions)				
Constraint	Implicit Congestion Charges	Spot Congestion Charges	Explicit Congestion Charges	Total Congestion Charges
Kanawha - Matt Funk	(\$34.3)	\$3.1	\$2.6	(\$28.7)
Cloverdale - Lexington	(\$14.2)	(\$13.8)	(\$0.4)	(\$28.3)
Axton	(\$6.2)	(\$0.0)	(\$0.8)	(\$6.9)
Bedington - Black Oak	\$5.6	(\$16.0)	\$3.8	(\$6.6)
Cedar Grove - Roseland	\$0.2	\$5.6	\$0.2	\$6.0
Branchburg - Readington	(\$0.3)	(\$3.9)	(\$0.1)	(\$4.3)
East	(\$0.7)	\$4.1	(\$0.0)	\$3.4
5004/5005 Interface	(\$1.3)	\$3.3	\$0.7	\$2.6
Kammer	(\$9.7)	\$11.0	\$0.7	\$2.0
Axton - Jacksons Ferry	(\$1.5)	(\$0.5)	\$0.1	(\$1.8)
Danville - East Danville	(\$0.9)	(\$0.5)	(\$0.3)	(\$1.8)
West	\$0.0	(\$1.2)	\$0.0	(\$1.1)
AP South	\$0.2	(\$1.7)	\$0.4	(\$1.1)
Meadow Brook	(\$0.3)	\$0.3	\$0.2	\$0.2
Wylie Ridge	\$0.3	(\$0.5)	\$0.4	\$0.2
Central	\$0.0	(\$0.3)	\$0.3	\$0.0

Conclusion

Congestion costs in the AEP service territory of Virginia decreased from 2005-2006 to 2006-2007. Implicit Congestion costs decreased by 74.7 million dollars from the period beginning October 1, 2005 to the period beginning October 1, 2006, with a significant decrease from the Kanawha – Matt Funk line. Spot Congestion costs were less for the 2006-2007 period than the 2005-2006 period by 2.9 million dollars and total Explicit Congestion charges increased by 7.7 million dollars from the period beginning October 2005 to the period beginning October 2006. The overall congestion costs in the AEP service territory of Virginia decreased by 69.9 million dollars.

ARRs and FTRs are designed to provide a hedge against congestion costs. This report does not include data on either ARRs or FTRs. That information will be provided in a future report. The data on ARRs and FTRs and congestion need to be considered together when evaluating the net impact of congestion on an area.

Congestion Definitions

Table 20 Congestion Definitions

Congestion Category	Calculation
Load Congestion Payments	Demand MWh * CLMP
Generation Congestion Credits	Supply MWh * CLMP
Net Congestion Bill	Load Congestion Payments - Generation Congestion Credits
Spot Market Congestion Credits	Net Interchange * Generation Weighted CLMP
Spot Market Congestion Charges	Net Interchange * Load Weighted CLMP
Spot Market Congestion Costs	Spot Market Congestion Charges - Spot Market Congestion Credits
Implicit Congestion Costs	Net Congestion Bill - Spot Market Congestion Costs
Explicit Congestion Costs	Transaction MW * (Sink CLMP - Source CLMP)
Total Congestion Costs	Implicit Congestion Costs + Spot Congestion Costs + Explicit Congestion Costs

MWh Category	Definition
Day-Ahead Demand MWh	Cleared Demand, Decrement Bids, Energy Sale Transactions
Day-Ahead Supply MWh	Cleared Generation, Increment Bids, Energy Purchase Transactions
Real-Time Demand MWh	Load and Energy Sale Transactions
Real-Time Supply MWh	Generation and Energy Purchase Transactions
Balancing Demand MWh	Real-Time Demand MWh - Day-Ahead Demand MWh
Balancing Supply MWh	Real-Time Supply MWh - Day-Ahead Supply MWh