2010 Year in Review

Monitoring Analytics, LLC
Independent Market Monitor for PJM

PJM Annual Meeting
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Market Monitor

Monitoring Analytics

Table 1-7 Total price per MWh by category and total revenues by category: Calendar years 2009 and 2010

Category	Totals ($ Millions) 2009	Totals ($ Millions) 2010	Percent Change Totals	2009 $/MWh	2010 $/MWh	Percent Change $/MWh	2009 Proportion of $/MWh	2010 Proportion of $/MWh	Percent Change in Proportions
Energy	$26,008.22	$33,717.30	29.6%	$39.05	$48.35	23.8%	69.9%	72.5%	3.6%
Capacity	$7,338.36	$8,409.34	14.6%	$11.02	$12.06	9.4%	19.7%	18.1%	(8.4%)
Transmission Service Charges	$2,663.31	$2,786.58	4.6%	$4.00	$4.00	(0.1%)	7.2%	6.0%	(16.4%)
Operating Reserves (Uplift)	$321.83	$547.68	70.2%	$0.48	$0.79	62.5%	0.9%	1.2%	36.0%
Reactive	$242.32	$310.08	28.0%	$0.36	$0.44	22.2%	0.7%	0.7%	2.3%
PJM Administrative Fees	$203.49	$248.02	21.9%	$0.31	$0.36	16.4%	0.5%	0.5%	(2.6%)
Regulation	$228.18	$241.39	5.8%	$0.34	$0.35	1.0%	0.6%	0.5%	(15.4%)
Transmission Enhancement Cost Recovery	$63.21	$139.36	120.5%	$0.09	$0.20	110.6%	0.2%	0.3%	76.2%
Transmssion Owner (Schedule 1A)	$56.47	$61.38	8.7%	$0.08	$0.09	3.8%	0.2%	0.1%	(13.1%)
Synchronized Reserves	$34.27	$43.85	27.9%	$0.05	$0.06	22.2%	0.1%	0.1%	2.3%
NERC/RFC	$8.86	$13.81	56.0%	$0.01	$0.02	49.0%	0.0%	0.0%	24.7%
Black Start	$14.27	$11.45	(19.7%)	$0.02	$0.02	(23.3%)	0.0%	0.0%	(35.8%)
RTO Startup and Expansion	$9.12	$8.99	(1.4%)	$0.01	$0.01	(5.9%)	0.0%	0.0%	(21.2%)
Day Ahead Scheduling Reserve (DASR)	$2.32	$7.37	217.7%	$0.00	$0.01	203.5%	0.0%	0.0%	154.0%
Load Response	$1.35	$3.11	129.9%	$0.00	$0.00	119.6%	0.0%	0.0%	83.8%
Transmission Facility Charges	$1.39	$1.39	(0.4%)	$0.00	$0.00	(4.9%)	0.0%	0.0%	(20.4%)
Total	$37,196.97	$46,530.41	25.1%	$55.85	$66.72	19.5%	100.0%	100.0%	0.0%

Table 3-42 PJM installed capacity (By fuel source): January 1, May 31, June 1, and December 31, 2010

	1-Jan-10		31-May-10		1-Jun-10		31-Dec-10	
	MW	Percent	MW	Percent	MW	Percent	MW	Percent
Coal	68,382.1	40.7%	68,155.5	40.7%	67,991.1	40.8%	68,007.0	40.8%
Gas	**49,238.8**	**29.3%**	**48,991.4**	**29.3%**	**48,424.5**	**29.0%**	**48,513.8**	**29.1%**
Hydroelectric	7,921.9	4.7%	7,923.5	4.7%	7,923.5	4.8%	7,954.5	4.8%
Nuclear	**30,611.9**	**18.2%**	**30,599.3**	**18.3%**	**30,619.0**	**18.4%**	**30,552.2**	**18.3%**
Oil	10,700.1	6.4%	10,649.4	6.4%	10,645.5	6.4%	10,193.6	6.1%
Solid waste	**672.1**	**0.4%**	**672.1**	**0.4%**	**672.1**	**0.4%**	**680.1**	**0.4%**
Wind	326.9	0.2%	409.5	0.2%	481.1	0.3%	610.9	0.4%
Total	**167,853.8**	**100.0%**	**167,400.7**	**100.0%**	**166,756.8**	**100.0%**	**166,512.1**	**100.0%**

Table 3-43 PJM generation (By fuel source (GWh)): Calendar year 2010

	2009 GWh	Percent	2010 GWh	Percent	Change in Output
Coal	349,818.2	50.5%	362,075.4	49.3%	3.5%
Nuclear	**249,392.3**	**36.0%**	**254,534.1**	**34.6%**	**2.1%**
Gas	67,218.9	9.7%	86,265.5	11.7%	28.3%
Natural Gas	65,848.2	9.5%	84,570.1	11.5%	28.4%
Landfill Gas	1,368.5	0.2%	1,695.0	0.2%	23.9%
Biomass Gas	2.2	0.0%	0.5	0.0%	(78.9%)
Hydroelectric	**14,123.0**	**2.0%**	**14,384.4**	**2.0%**	**1.9%**
Wind	5,489.7	0.8%	8,812.8	1.2%	60.5%
Waste	**5,664.7**	**0.8%**	**5,356.6**	**0.7%**	**(5.4%)**
Solid Waste	**4,147.0**	**0.6%**	**4,157.5**	**0.6%**	**0.3%**
Miscellaneous	**1,517.7**	**0.2%**	**1,199.1**	**0.2%**	**(21.0%)**
Oil	1,568.1	0.2%	3,243.2	0.4%	106.8%
Heavy Oil	1,383.7	0.2%	2,748.3	0.4%	98.6%
Light Oil	162.9	0.0%	446.9	0.1%	174.3%
Diesel	14.4	0.0%	32.3	0.0%	123.9%
Kerosene	7.1	0.0%	15.7	0.0%	120.8%
Jet Oil	0.0	0.0%	0.1	0.0%	51.9%
Solar	**3.5**	**0.0%**	**5.7**	**0.0%**	**64.7%**
Battery	0.3	0.0%	0.3	0.0%	18.9%
Total	**693,278.7**	**100.0%**	**734,678.2**	**100.0%**	**6.0%**

Figure 2-1 Average PJM aggregate supply curves: Summers 2009 and 2010

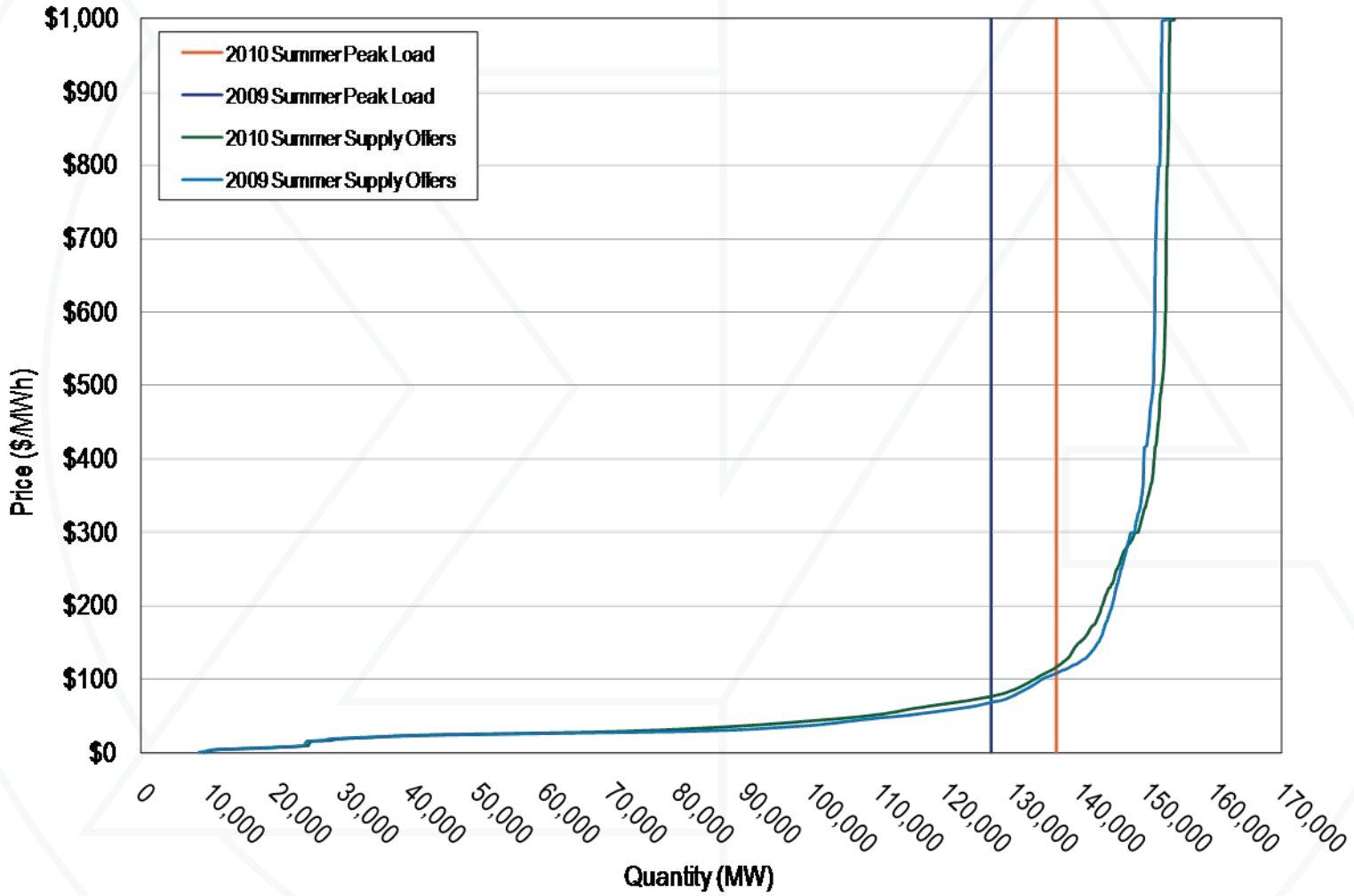

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Figure 2-13 Price duration curves for the PJM Real-Time Energy Market during hours above the 95th percentile: Calendar years 2006 to 2010

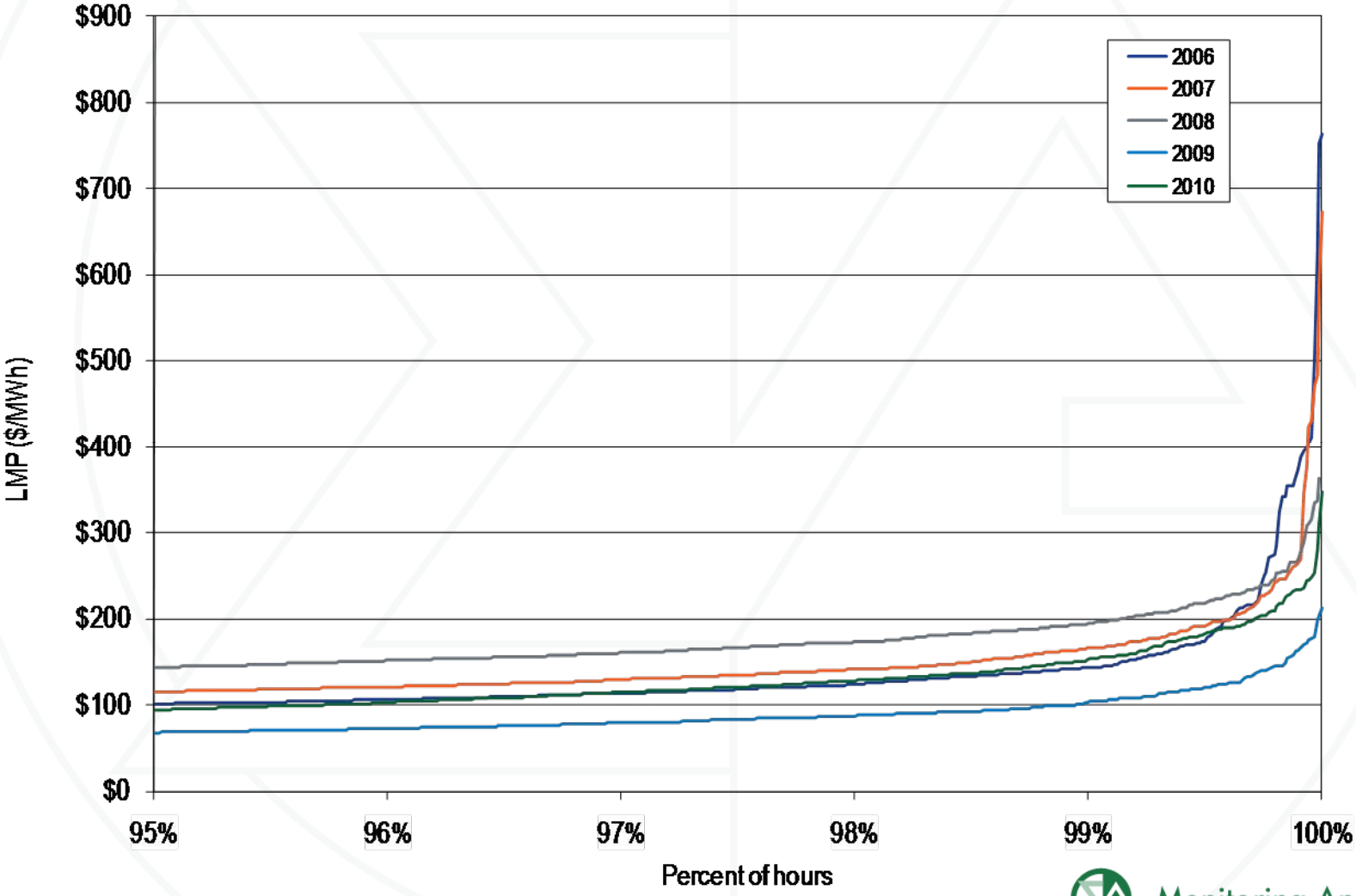

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Table 2-28 PJM real-time average hourly load: Calendar years 1998 to 2010

	PJM Real-Time Load (MWh)			Year-to-Year Change		
	Average	Median	Standard Deviation	Average	Median	Standard Deviation
1998	28,578	28,653	5,511	NA	NA	NA
1999	29,641	29,341	5,956	**3.7%**	**2.4%**	**8.1%**
2000	30,113	30,170	5,529	1.6%	2.8%	(7.2%)
2001	30,297	30,219	5,873	**0.6%**	**0.2%**	**6.2%**
2002	35,731	34,746	8,013	17.9%	15.0%	36.5%
2003	37,398	37,031	6,832	**4.7%**	**6.6%**	**(14.7%)**
2004	49,963	48,103	13,004	33.6%	29.9%	90.3%
2005	78,150	76,247	16,296	**56.4%**	**58.5%**	**25.3%**
2006	79,471	78,473	14,534	1.7%	2.9%	(10.8%)
2007	**81,681**	**80,914**	**14,618**	**2.8%**	**3.1%**	**0.6%**
2008	79,515	78,481	13,758	(2.7%)	(3.0%)	(5.9%)
2009	**76,035**	**75,471**	**13,260**	**(4.4%)**	**(3.8%)**	**(3.6%)**
2010	79,611	77,430	15,504	4.7%	2.6%	16.9%

Table 2-38 PJM real-time, annual, load-weighted, average LMP (Dollars per MWh): Calendar years 1998 to 2010

	Real-Time, Load-Weighted, Average LMP			Year-to-Year Change		
	Average	Median	Standard Deviation	Average	Median	Standard Deviation
1998	$24.16	$17.60	$39.29	NA	NA	NA
1999	$34.07	$19.02	$91.49	**41.0%**	**8.1%**	**132.8%**
2000	$30.72	$20.51	$28.38	(9.8%)	7.9%	(69.0%)
2001	$36.65	$25.08	$57.26	**19.3%**	**22.3%**	**101.8%**
2002	$31.60	$23.40	$26.75	(13.8%)	(6.7%)	(53.3%)
2003	$41.23	$34.96	$25.40	**30.5%**	**49.4%**	**(5.0%)**
2004	$44.34	$40.16	$21.25	7.5%	14.9%	(16.3%)
2005	$63.46	$52.93	$38.10	**43.1%**	**31.8%**	**79.3%**
2006	$53.35	$44.40	$37.81	(15.9%)	(16.1%)	(0.7%)
2007	**$61.66**	**$54.66**	**$36.94**	**15.6%**	**23.1%**	**(2.3%)**
2008	$71.13	$59.54	$40.97	15.4%	8.9%	10.9%
2009	**$39.05**	**$34.23**	**$18.21**	**(45.1%)**	**(42.5%)**	**(55.6%)**
2010	$48.35	$39.13	$28.90	23.8%	14.3%	58.7%

Table 2-41 PJM real-time annual, fuel-cost-adjusted, load-weighted LMP (Dollars per MWh): Year-over-year method

	2010 Load-Weighted LMP	2010 Fuel-Cost-Adjusted, Load-Weighted LMP	Change
Average	$48.35	$46.70	(3.4%)
	2009 Load-Weighted LMP	**2010 Fuel-Cost-Adjusted, Load-Weighted LMP**	**Change**
Average	$39.05	$46.70	19.6%
	2009 Load-Weighted LMP	**2010 Load-Weighted LMP**	**Change**
Average	$39.05	$48.35	23.8%

Table 7-1 Total annual PJM congestion (Dollars (Millions)): Calendar years 2003 to 2010

	Congestion Charges	Percent Change	Total PJM Billing	Percent of PJM Billing
2003	$464	NA	$6,900	7%
2004	$750	62%	$8,700	9%
2005	$2,092	179%	$22,630	9%
2006	$1,603	(23%)	$20,945	8%
2007	$1,846	15%	$30,556	6%
2008	$2,117	15%	$34,306	6%
2009	$719	(66%)	$26,550	3%
2010	$1,428	99%	$34,771	4%
Total	$9,591		$185,358	5%

Table 2-42 Components of PJM real-time, annual, load-weighted, average LMP: Calendar year 2010

Element	Contribution to LMP	Percent
Coal	$19.07	39.4%
Gas	$18.12	37.5%
10% Cost Adder	$4.19	8.7%
VOM	$2.64	5.5%
Oil	$1.78	3.7%
NO_x	$0.86	1.8%
NA	$0.57	1.2%
CO_2	$0.40	0.8%
Markup	$0.31	0.6%
SO_2	$0.25	0.5%
FMU Adder	$0.11	0.2%
Dispatch Differential	$0.06	0.1%
Shadow Price Limit Adder	$0.03	0.1%
Municipal Waste	$0.01	0.0%
Offline CT Adder	$0.00	0.0%
M2M Adder	($0.00)	(0.0%)
Wind	($0.02)	(0.0%)
Unit LMP Differential	($0.03)	(0.1%)
Total	$48.35	100.0%

Table 2-7 Annual offer-capping statistics: Calendar years 2006 to 2010

	Real Time		Day Ahead	
	Unit Hours Capped	MW Capped	Unit Hours Capped	MW Capped
2006	1.0%	0.2%	0.4%	0.1%
2007	1.1%	0.2%	0.2%	0.0%
2008	1.0%	0.2%	0.2%	0.1%
2009	0.4%	0.1%	0.1%	0.0%
2010	1.2%	0.4%	0.2%	0.1%

Table 2-8 Real time offer-capped unit statistics: Calendar year 2010

Run Hours Offer-Capped, Percent Greater Than Or Equal To:	2010 Offer-Capped Hours					
	Hours ≥ 500	Hours ≥ 400 and < 500	Hours ≥ 300 and < 400	Hours ≥ 200 and < 300	Hours ≥ 100 and < 200	Hours ≥ 1 and < 100
90%	2	0	0	0	1	13
80% and < 90%	**0**	**2**	**1**	**7**	**8**	**13**
75% and < 80%	0	0	0	0	3	7
70% and < 75%	**3**	**0**	**0**	**0**	**4**	**13**
60% and < 70%	0	1	1	1	0	34
50% and < 60%	**1**	**0**	**0**	**5**	**0**	**22**
25% and < 50%	4	2	4	9	17	41
10% and < 25%	**2**	**0**	**0**	**4**	**2**	**37**

Table 3-36 Proportion of units recovering avoidable costs from energy and ancillary markets as well as total markets for calendar years 2009 and 2010

	2009		2010	
Technology	Units with full recovery from Energy Markets	Units with full recovery from all markets	Units with full recovery from Energy Markets	Units with full recovery from all markets
CC - NUG Cogeneration Frame B or E Technology	0%	100%	30%	100%
CC - Three on One Frame E Technology	**54%**	**100%**	**85%**	**100%**
CC - Two or Three on One Frame F Technology	83%	100%	93%	100%
CT - First & Second Generation Aero (P&W FT 4)	**6%**	**100%**	**32%**	**100%**
CT - First & Second Generation Frame B	2%	100%	22%	99%
CT - Second Generation Frame E	**0%**	**100%**	**42%**	**100%**
CT - Third Generation Aero (GE LM 6000)	16%	100%	32%	100%
CT - Third Generation Aero (P&W FT- 8 TwinPak)	**0%**	**100%**	**33%**	**100%**
CT - Third Generation Frame F	25%	100%	62%	100%
Diesel	**12%**	**96%**	**13%**	**100%**
Hydro	100%	100%	100%	100%
Nuclear	**93%**	**100%**	**100%**	**100%**
Oil or Gas Steam	3%	92%	3%	92%
Sub-Critical Coal	**30%**	**75%**	**52%**	**82%**
Super Critical Coal	35%	82%	50%	82%

Figure 5-1 History of capacity prices: Calendar year 1999 through 2013

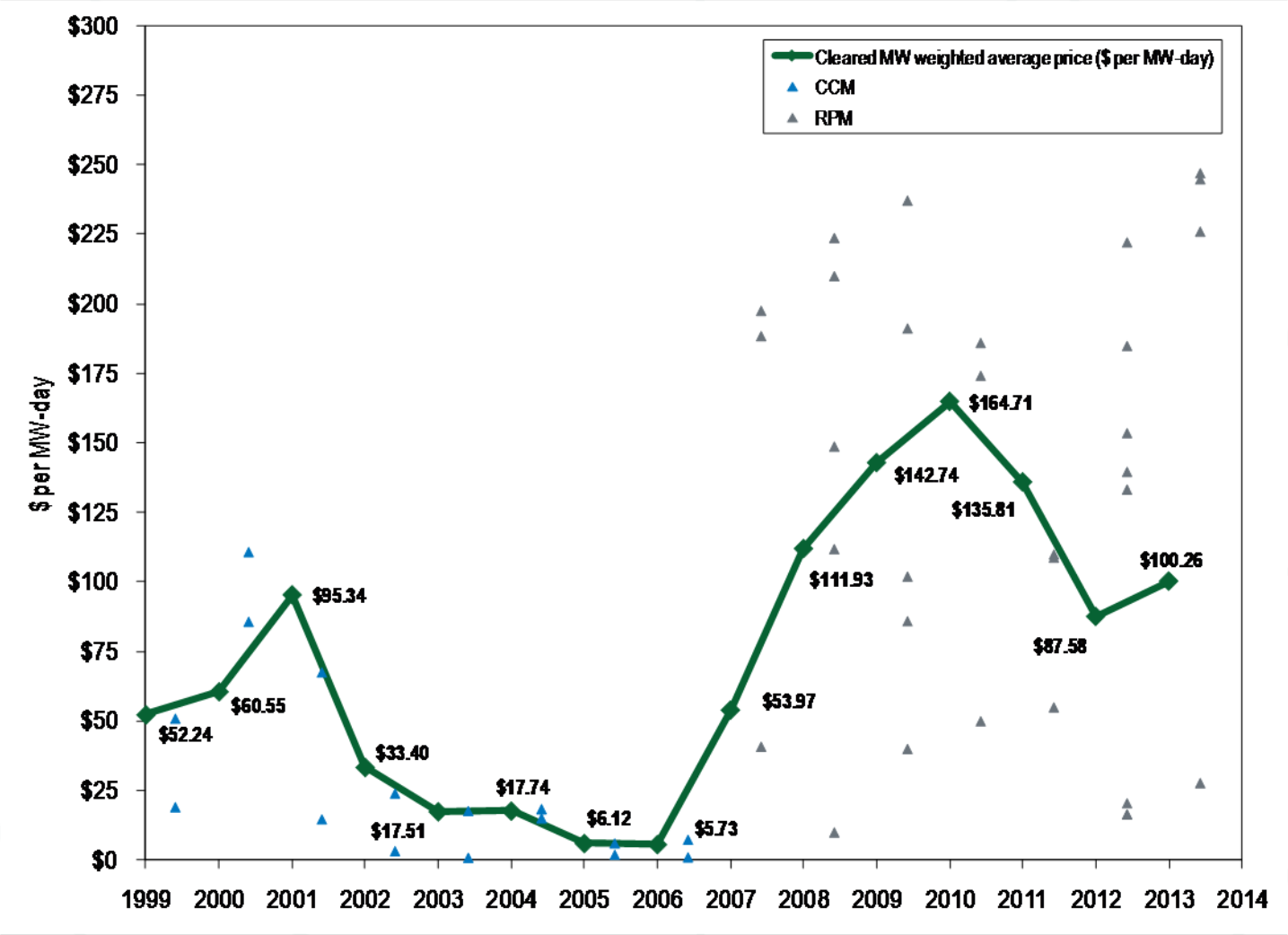
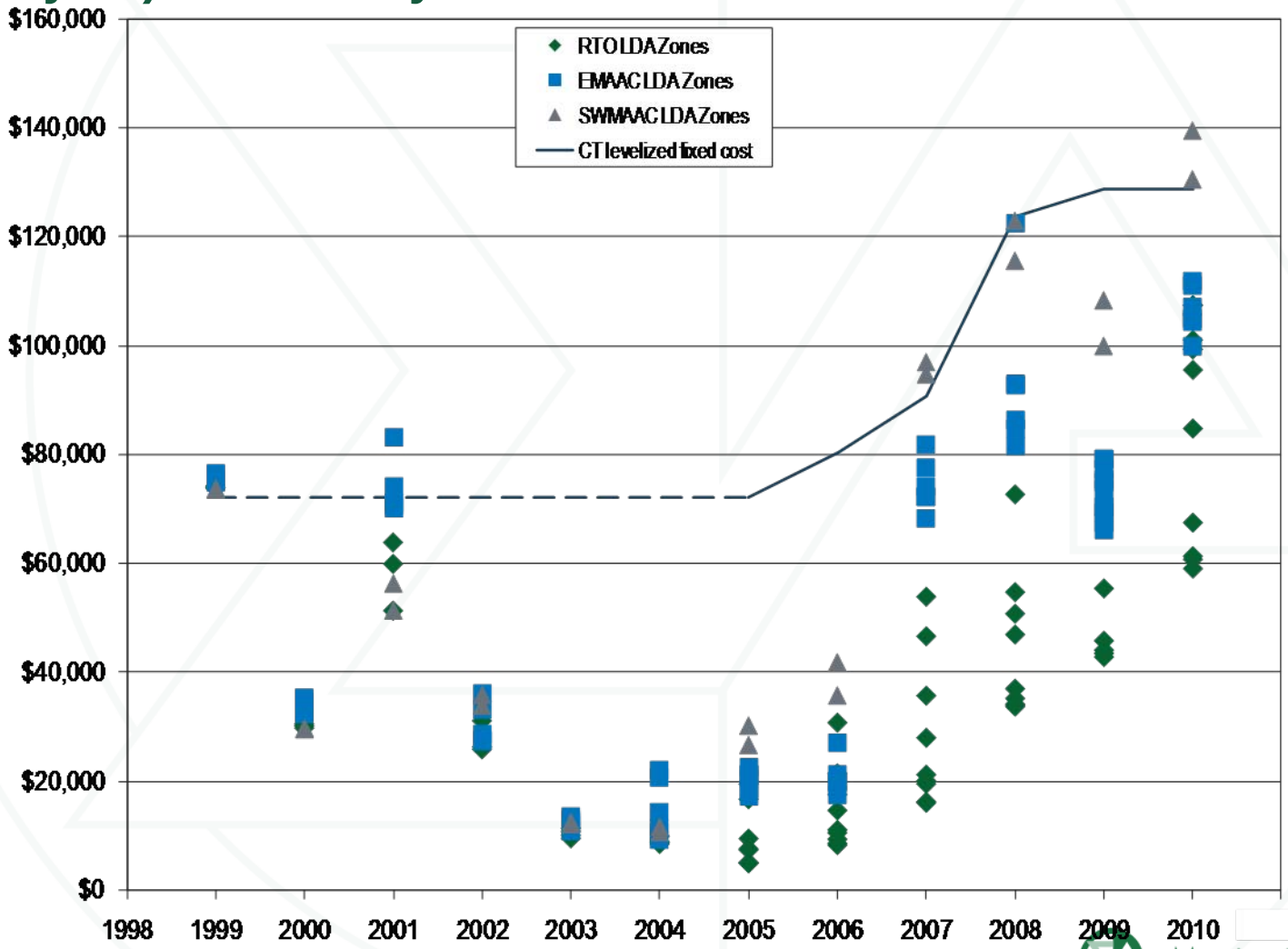


Figure 3-5 New entrant CT real-time net revenue and 20-year levelized fixed cost as of 2010 by LDA (Dollars per installed MW-year): Calendar years 1999 to 2010



Status of coal units in PJM

- **Coal units comprise 41 percent of capacity in PJM at YE 2010.**
- **Coal units comprise 49 percent of energy output in PJM in 2010.**
- **The MMU's State of the Market Report for 2011 (SOM) includes analysis of the sufficiency of net revenues for new coal units.**
- **The SOM includes analysis of the sufficiency of actual net revenues.**
- **The SOM includes analysis of the potential impacts of new environmental regulations on coal units in PJM.**

Figure 3-11 New entrant CP real-time net revenue and 20-year levelized fixed cost as of 2010 by LDA (Dollars per installed MW-year): Calendar years 1999 to 2010

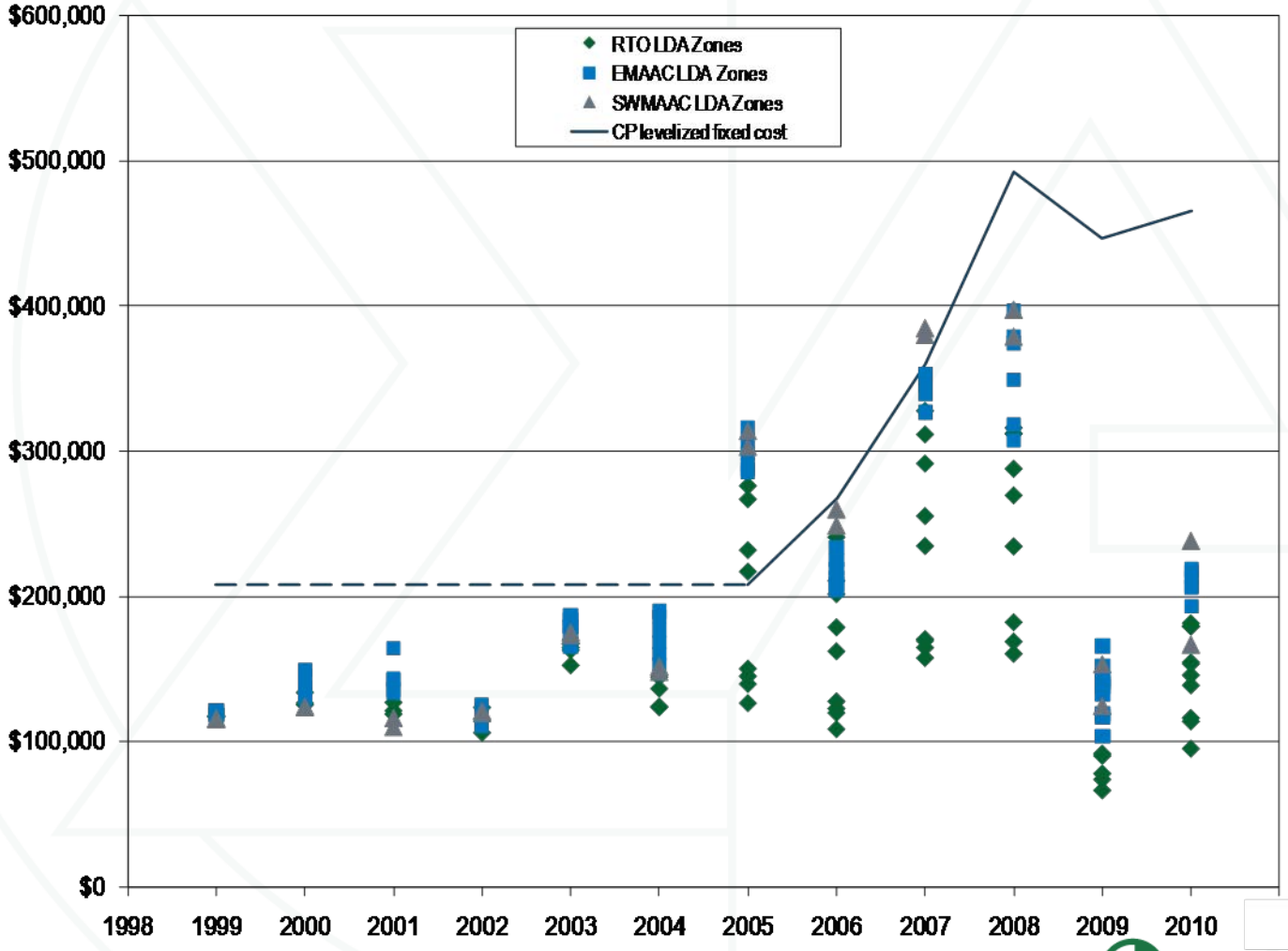


Table 3-58 SO_2 emission controls (FGD) by unit type (MW), as of December 31, 2010 (includes FRR and imports)

	SO_2 Controlled	No SO_2 Controls	Total	Percent Controlled
Coal Steam	48,946.7	27,274.0	76,220.7	64.2%
Combined Cycle	**0.0**	**21,542.4**	**21,542.4**	**0.0%**
Combustion Turbine	0.0	31,519.2	31,519.2	0.0%
Diesel	**0.0**	**342.4**	**342.4**	**0.0%**
Non-Coal Steam	0.0	10,837.0	10,837.0	0.0%
Total	**48,946.7**	**91,515.0**	**140,461.7**	**34.8%**

Table 3-59 NO_x emission controls by unit type (MW), as of December 31, 2010

	NO_x Controlled	No NO_x Controls	Total	Percent Controlled
Coal Steam	74,122.9	2,097.8	76,220.7	97.2%
Combined Cycle	**21,392.4**	**150.0**	**21,542.4**	**99.3%**
Combustion Turbine	26,097.5	5,421.7	31,519.2	82.8%
Diesel	**0.0**	**342.4**	**342.4**	**0.0%**
Non-Coal Steam	5,808.1	5,028.9	10,837.0	53.6%
Total	**127,420.9**	**13,040.8**	**140,461.7**	**90.7%**

Table 3-60 Particulate emission controls by unit type (MW), as of December 31, 2010

	Particulate Controlled	No Particulate Controls	Total	Percent Controlled
Coal Steam	74,621.7	1,599.0	76,220.7	97.9%
Combined Cycle	**0.0**	**21,542.4**	**21,542.4**	**0.0%**
Combustion Turbine	0.0	31,519.2	31,519.2	0.0%
Diesel	**0.0**	**342.4**	**342.4**	**0.0%**
Non-Coal Steam	3,047.0	7,790.0	10,837.0	28.1%
Total	**77,668.7**	**62,793.0**	**140,461.7**	**55.3%**

Table 3-37 Profile of coal units not recovering avoidable costs from all PJM Market net revenues for 2010

Technology	Coal plants with full recovery of avoidable costs	Coal plants with less than full recovery of avoidable costs
Total Installed Capacity	37,808	6,769
Installed Capacity within MAAC	**12,978**	**6,021**
Avg. Installed Capacity (ICAP)	**282.1**	**225.6**
Avg. Age of Plant (Years)	40	50
Avg. Heat Rate (Btu/kWh)	**10,872**	**11,429**
Avg. Run Hours (Hours)	6,505	3,847
Avg. Avoidable Costs	**$61,748**	**$145,904**
Avg. Incremental Cost per MWh	$29.92	$43.08

Table 3-39 Units lacking controls for either NO_x emission rates, SO_2 emission rates, or both as of January 2010 (RPM units)

Characteristics	Coal plants without NOx controls in place	Coal plants without SO2 controls in place	Coal plants without NOx and without SO2 controls in place	Total
Number of units	4	63	8	75
Total installed capacity (ICAP)	212	13,543	633	14,388

Table 3-40 Attributes of units lacking controls for either NO_x emission rates, SO_2 emission rates, or both as of January, 2010

Characteristics	Coal plants with both NO_x and SO_2 controls in place	Coal plants lacking controls for either NO_x or SO_2
Units	89	75
Total installed capacity (ICAP)	**30,189**	**14,388**
ICAP within MAAC	14,163	4,835
ICAP in rest of RTO	**16,026**	**9,552**
ICAP associated with plants older than 40 years	**13,811**	**12,105**
ICAP associated with small coal plants (200 MW or less)	4,322	5,359
ICAP associated with medium-sized coal plants (between 200 and 500 MW)	**5,457**	**3,603**
ICAP associated with large coal plants (500 MW or greater)	19,910	5,426
ICAP associated with 100 percent recovery of avoidable costs	24,872	12,936
ICAP associated with less than 100 percent recovery of avoidable costs	**5,318**	**1,451**

Table 3-41 Total installed capacity associated with estimated levels of additional revenue needed for recovery of project investment associated with environmental controls

Ranges of additional revenue needed ($/MW-day)	Installed capacity (ICAP) associated base case	Cumulative installed capacity (ICAP) associated with base case	Installed capacity (ICAP) associated with NO_x sensitivity	Cumulative installed capacity (ICAP) associated with NO_x sensitivity
$0	43	43	2,816	2,816
$1 - $99	**121**	**164**	**1,050**	**3,867**
$100 - $199	50	214	1,706	5,573
$200 - $299	**0**	**214**	**1,560**	**7,133**
$300 - $399	1,143	1,357	489	7,621
$400 - $499	**7,554**	**8,911**	**4,352**	**11,973**
$500 - $599	3,420	12,331	815	12,788
$600 - $799	**1,336**	**13,666**	**6,107**	**18,894**
$800 or greater	721	14,388	2,990	21,884

Figure 4-1 PJM real-time scheduled imports and exports: January through March 2011 (See 2010 SOM, Figure 4-1)

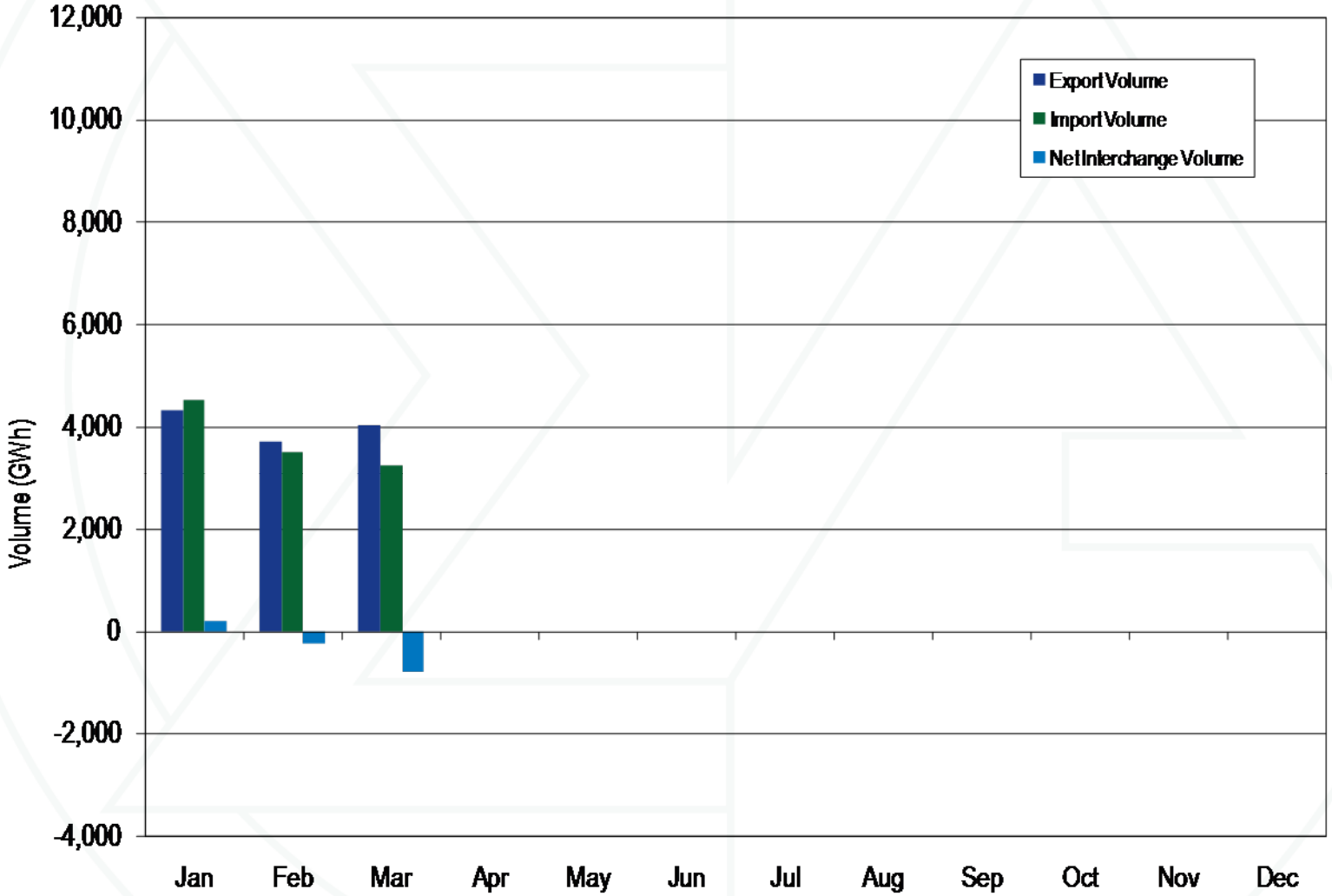


Figure 4-2 PJM day-ahead scheduled imports and exports: January through March 2011 (See 2010 SOM, Figure 4-2)

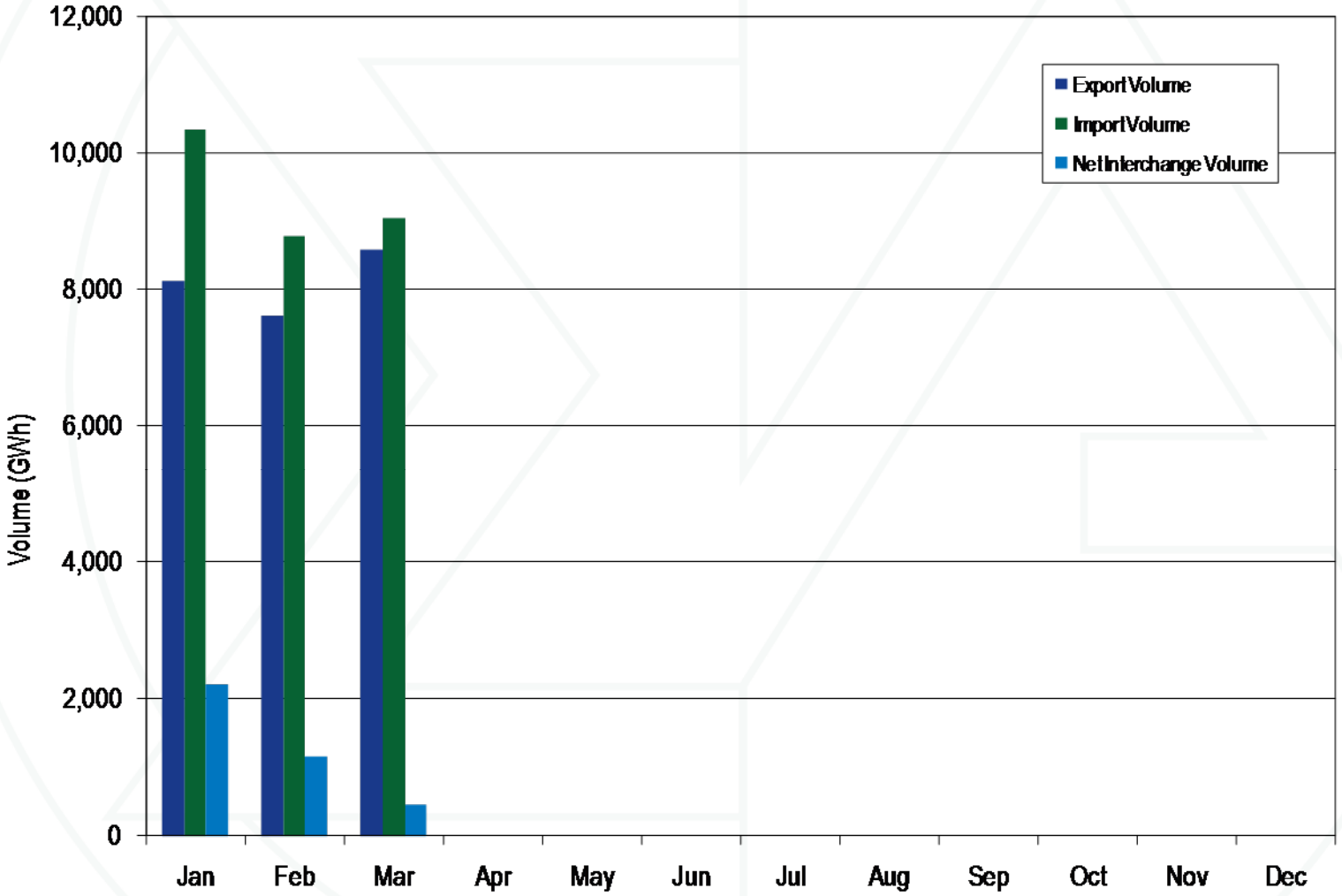
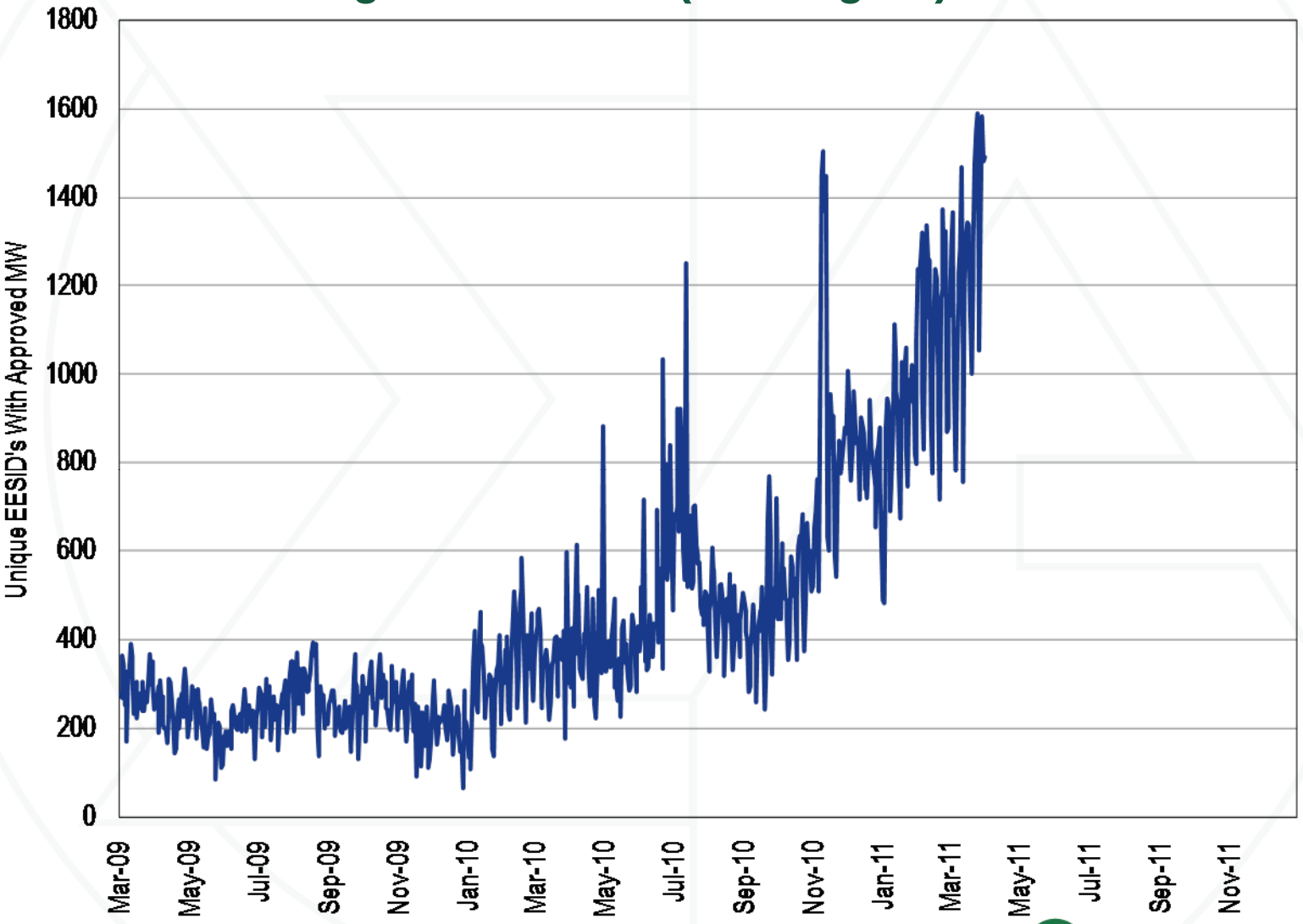
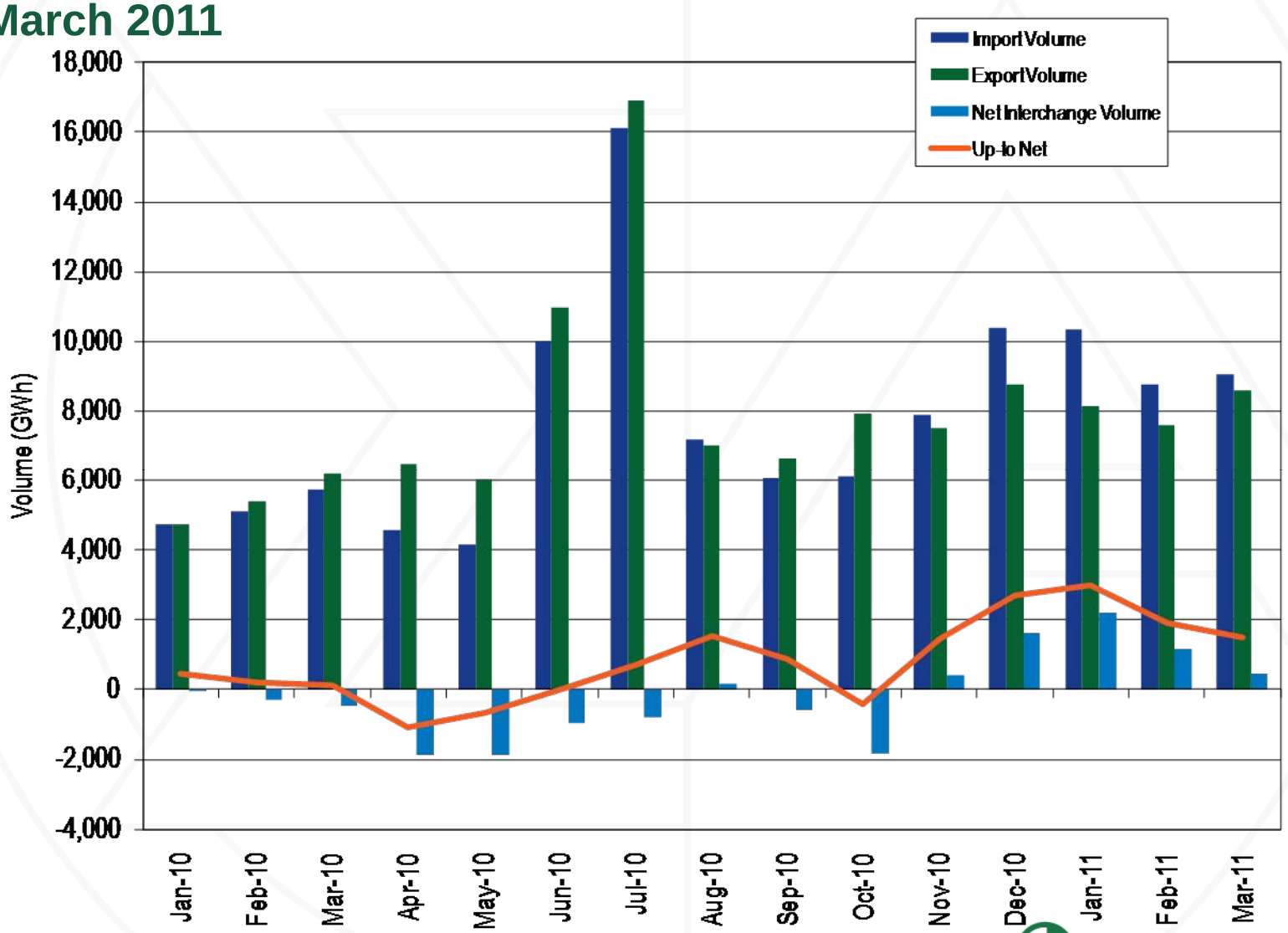


Figure 4-20 Unique up-to congestion bids with approved MWh: March 2009 through March 2011 (New Figure)



New Figure – PJM day-ahead scheduled imports and exports showing net up-to congestion volume: January 2010 through March 2011



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