

Market Monitor Report

MC Webinar
August 24, 2015

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Monitoring Analytics

State of the Market Report

New Recommendations

New Recommendation from Section 3, Energy Market

- **The MMU recommends that PJM remove non-specific fuel types such as “other” or “co-fire other” from the list of fuel types available for market participants to identify the fuel type associated with their price and cost schedules. The MMU recommends that PJM require every market participant to make available at least one cost schedule with the same fuel-type and parameters as that of their offered price schedule. (Priority: Medium. New recommendation. Status: Not adopted.)**

State of the Market Report

New Recommendations

New Recommendation from Section 6, Demand Response

- **The MMU recommends that the tariff rules for demand response clarify that a resource and its CSP, if any, must notify PJM of material changes affecting the capability of the resource to perform as registered and to terminate registrations that are no longer capable of responding to PJM dispatch directives, such as in the case of bankrupt and out of service facilities. (Priority: Medium. New recommendation. Status: Not adopted.)**

State of the Market Report

New Recommendations

New Recommendation from Section 10, Ancillary Services

- **The MMU recommends that a reason code be attached to every hour in which PJM dispatch adds additional DASR MW. The addition of such a code would make the reason explicit, increase transparency and facilitate analysis of the use of PJM's ability to add DASR MW. (Priority: Medium. New recommendation. Status: not adopted.**

State of the Market Report

New Recommendations

New Recommendation from Section 12, Planning

- **The MMU recommends that PJM enhance the transparency and queue management process for merchant transmission investment. Issues related to data access and complete explanations of cost impacts should be addressed. The goal should be to remove barriers to competition from merchant transmission. (Priority: Medium. New recommendation. Status: Not adopted.)**

Table 1-8 Total price per MWh by category: January through June, 2014 and 2015

Category	Jan-Jun 2014 \$/MWh	Jan-Jun 2014 Percent of Total	Jan-Jun 2015 \$/MWh	Jan-Jun 2015 Percent of Total	Percent Change Totals
Load Weighted Energy	\$69.92	78.6%	\$42.30	68.7%	(39.5%)
Capacity	\$8.56	9.6%	\$9.65	15.7%	12.8%
Transmission Service Charges	\$5.67	6.4%	\$6.79	11.0%	19.8%
Energy Uplift (Operating Reserves)	\$2.07	2.3%	\$0.57	0.9%	(72.5%)
Transmission Enhancement Cost Recovery	\$0.39	0.4%	\$0.47	0.8%	19.2%
PJM Administrative Fees	\$0.45	0.5%	\$0.44	0.7%	(1.7%)
Reactive	\$0.42	0.5%	\$0.38	0.6%	(8.6%)
Regulation	\$0.46	0.5%	\$0.29	0.5%	(36.5%)
Capacity (FRR)	\$0.10	0.1%	\$0.25	0.4%	140.2%
Synchronized Reserves	\$0.36	0.4%	\$0.16	0.3%	(55.4%)
Transmission Owner (Schedule 1A)	\$0.09	0.1%	\$0.09	0.1%	5.5%
Day Ahead Scheduling Reserve (DASR)	\$0.09	0.1%	\$0.08	0.1%	(11.8%)
Black Start	\$0.06	0.1%	\$0.06	0.1%	(4.9%)
NERC/RFC	\$0.02	0.0%	\$0.03	0.0%	31.6%
Non-Synchronized Reserves	\$0.03	0.0%	\$0.02	0.0%	(29.3%)
Load Response	\$0.03	0.0%	\$0.02	0.0%	(29.1%)
RTO Startup and Expansion	\$0.01	0.0%	\$0.01	0.0%	(8.3%)
Emergency Load Response	\$0.11	0.1%	\$0.00	0.0%	NA
Emergency Energy	\$0.07	0.1%	\$0.00	0.0%	NA
Transmission Facility Charges	\$0.00	0.0%	\$0.00	0.0%	(100.0%)
Total	\$88.90	100.0%	\$61.61	100.0%	(30.7%)

Figure 3-4 Average PJM aggregate real-time generation supply curves by offer price: January through June of 2014 and 2015

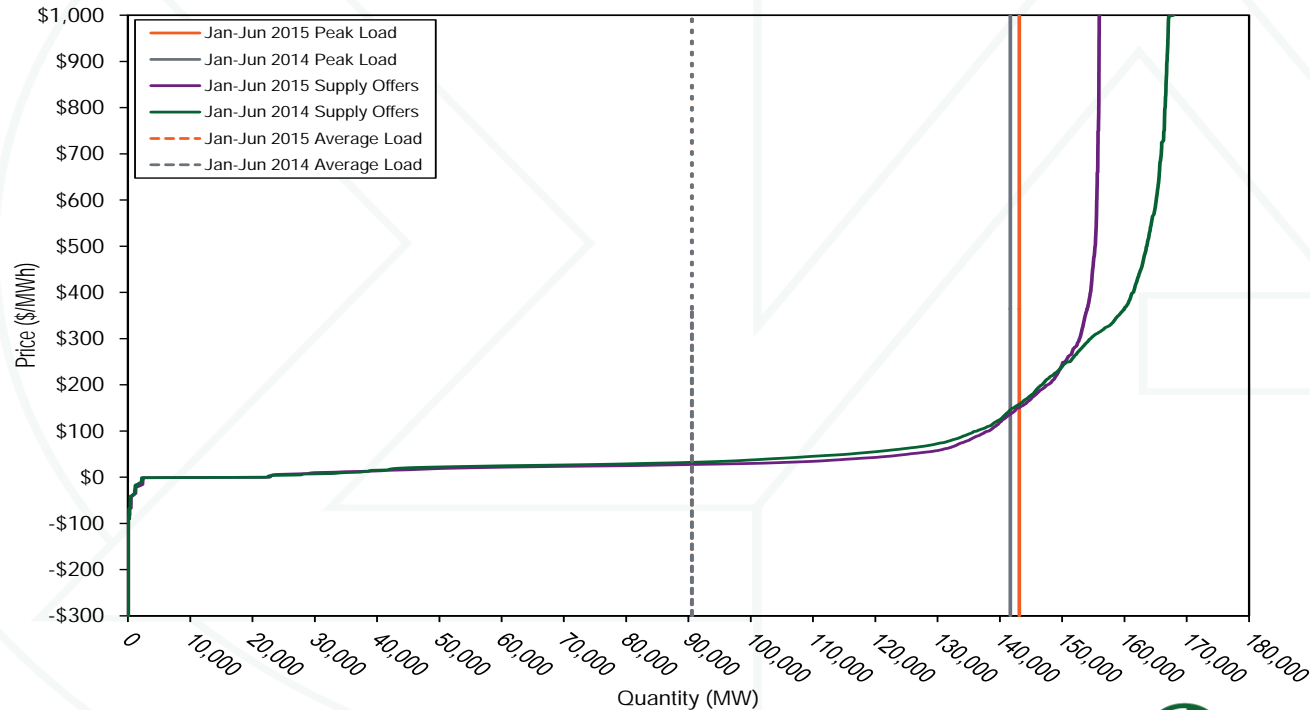


Table 3-15 PJM real-time average hourly load and real-time average hourly load plus average hourly exports: January through June of 1998 through 2015

	PJM Real-Time Demand (MWh)				Year-to-Year Change			
	Load		Load Plus Exports		Load		Load Plus Exports	
	Standard Load	Standard Deviation	Standard Demand	Standard Deviation	Standard Load	Standard Deviation	Standard Demand	Standard Deviation
1998	27,662	4,703	27,662	4,703	NA	NA	NA	NA
1999	28,714	5,113	28,714	5,113	3.8%	8.7%	3.8%	8.7%
2000	29,649	5,382	29,902	5,511	3.3%	5.3%	4.1%	7.8%
2001	30,180	5,274	32,041	5,103	1.8%	(2.0%)	7.2%	(7.4%)
2002	32,678	6,457	33,969	6,557	8.3%	22.4%	6.0%	28.5%
2003	36,727	6,428	38,775	6,554	12.4%	(0.4%)	14.1%	(0.0%)
2004	41,787	8,999	44,808	10,033	13.8%	40.0%	15.6%	53.1%
2005	71,939	13,603	78,745	13,798	72.2%	51.2%	75.7%	37.5%
2006	77,232	12,003	83,606	12,377	7.4%	(11.8%)	6.2%	(10.3%)
2007	81,110	13,499	86,557	13,819	5.0%	12.5%	3.5%	11.6%
2008	78,685	12,819	85,819	13,242	(3.0%)	(5.0%)	(0.9%)	(4.2%)
2009	75,991	12,899	81,062	13,253	(3.4%)	0.6%	(5.5%)	0.1%
2010	78,106	13,643	83,758	14,227	2.8%	5.8%	3.3%	7.3%
2011	78,823	13,931	84,288	14,046	0.9%	2.1%	0.6%	(1.3%)
2012	84,946	13,941	89,638	13,848	7.8%	0.1%	6.3%	(1.4%)
2013	86,897	13,871	91,199	13,848	2.3%	(0.5%)	1.7%	0.0%
2014	90,529	16,266	96,189	16,147	4.2%	17.3%	5.5%	16.6%
2015	90,586	16,192	94,782	16,589	0.1%	(0.5%)	(1.5%)	2.7%

Figure 3-15 PJM real-time monthly average hourly load: January 2014 through June 2015

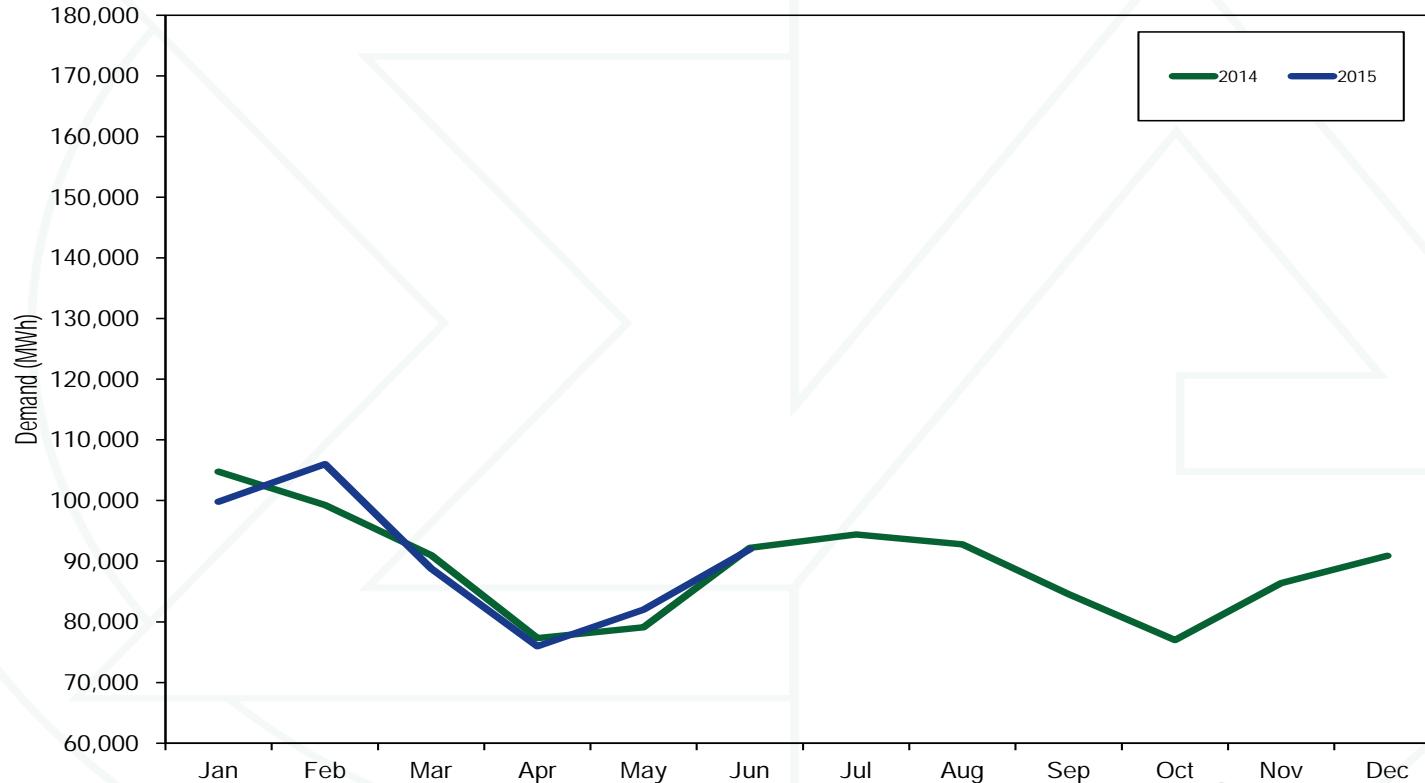


Table 3-63 PJM real-time, load-weighted, average LMP (Dollars per MWh): January through June of 1998 through 2015

(Jan-Jun)	Real-Time, Load-Weighted, Average LMP			Year-to-Year Change		
	Average	Median	Standard Deviation	Average	Median	Standard Deviation
1998	\$21.66	\$16.80	\$18.39	NA	NA	NA
1999	\$25.34	\$18.59	\$52.06	17.0%	10.7%	183.1%
2000	\$27.76	\$18.91	\$29.69	9.5%	1.7%	(43.0%)
2001	\$35.27	\$27.88	\$22.12	27.0%	47.4%	(25.5%)
2002	\$25.93	\$20.67	\$14.62	(26.5%)	(25.9%)	(33.9%)
2003	\$44.43	\$37.98	\$28.55	71.4%	83.8%	95.2%
2004	\$47.62	\$43.96	\$23.30	7.2%	15.8%	(18.4%)
2005	\$48.67	\$42.30	\$24.81	2.2%	(3.8%)	6.5%
2006	\$51.83	\$45.79	\$26.54	6.5%	8.3%	7.0%
2007	\$58.32	\$52.52	\$32.39	12.5%	14.7%	22.1%
2008	\$74.77	\$64.26	\$44.25	28.2%	22.4%	36.6%
2009	\$42.48	\$36.95	\$20.61	(43.2%)	(42.5%)	(53.4%)
2010	\$45.75	\$38.78	\$23.60	7.7%	5.0%	14.5%
2011	\$48.47	\$38.63	\$37.59	5.9%	(0.4%)	59.3%
2012	\$31.21	\$28.98	\$17.69	(35.6%)	(25.0%)	(52.9%)
2013	\$37.96	\$33.58	\$18.54	21.6%	15.9%	4.8%
2014	\$69.92	\$42.61	\$103.35	84.2%	26.9%	457.6%
2015	\$42.30	\$30.34	\$37.85	(39.5%)	(28.8%)	(63.4%)

Figure 3-32 PJM real-time, monthly and annual, load-weighted, average LMP: January 1999 through June 2015

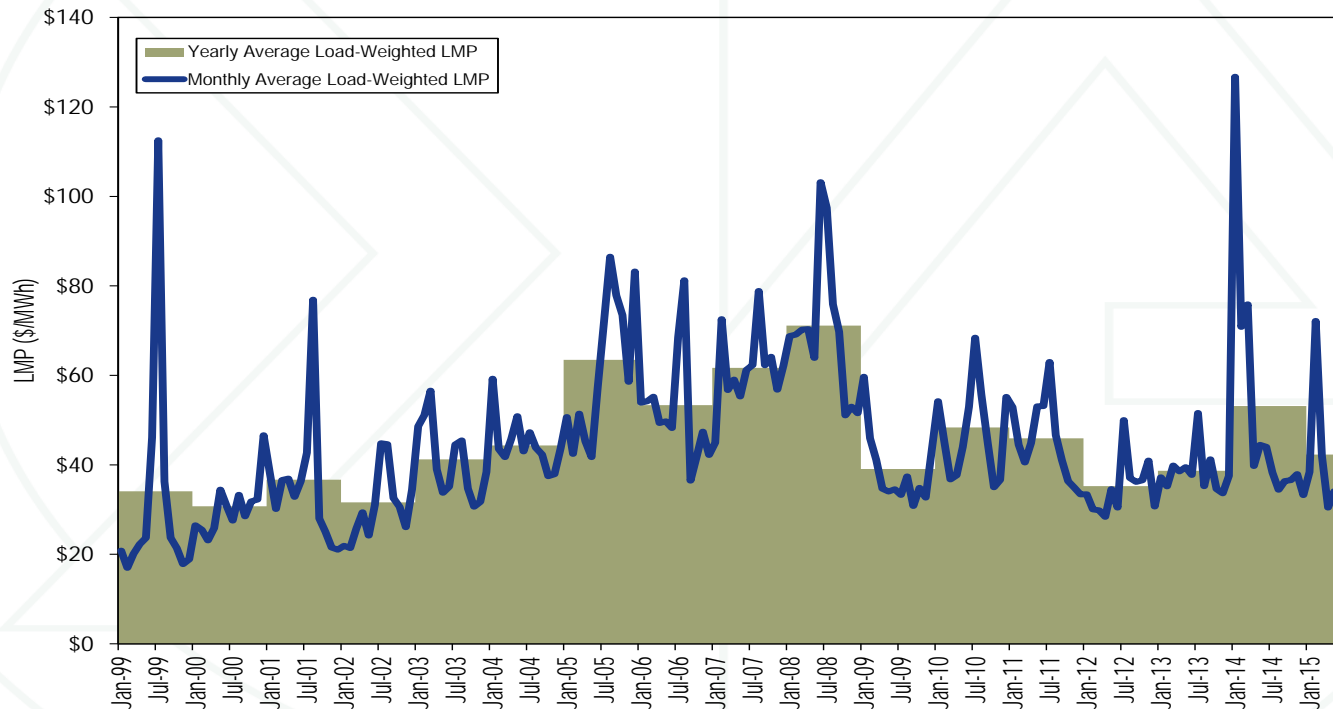


Figure 3-33 Spot average fuel price comparison with fuel delivery charges: 2012 through June, 2015 (\$/MMBtu)

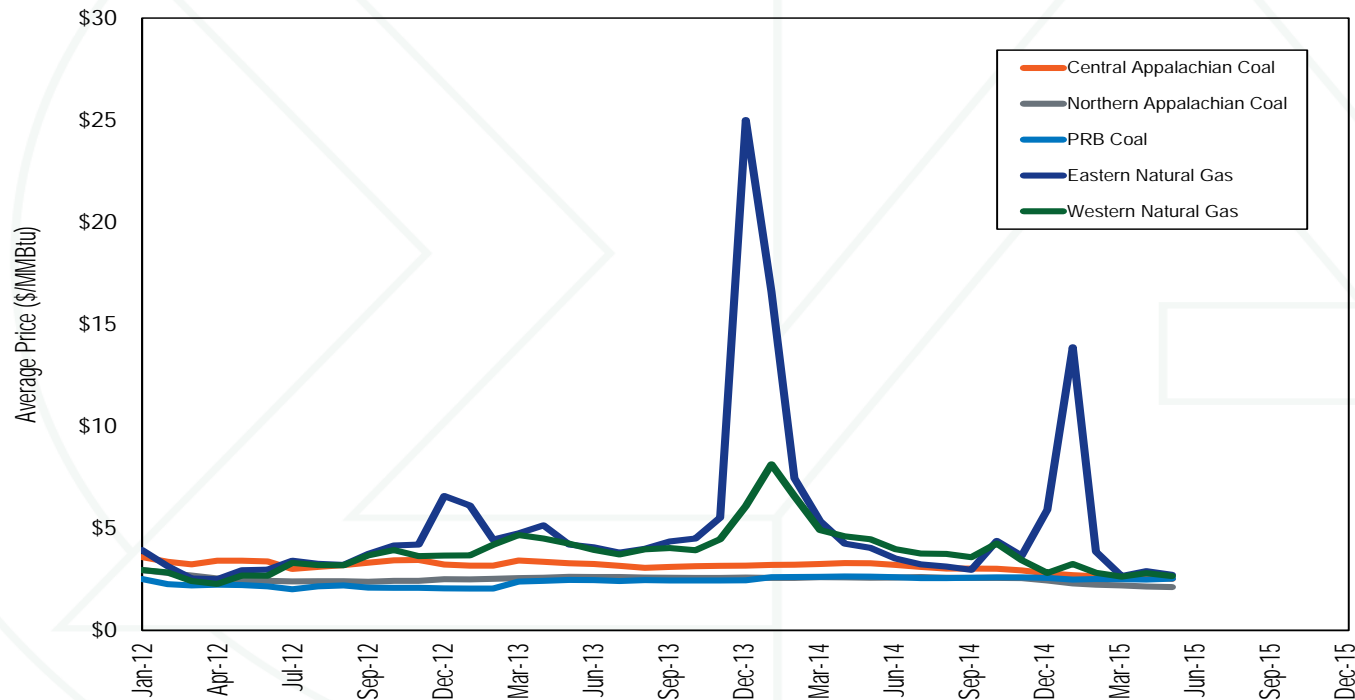


Figure 7-2 Average operating costs: 2009 through 2015

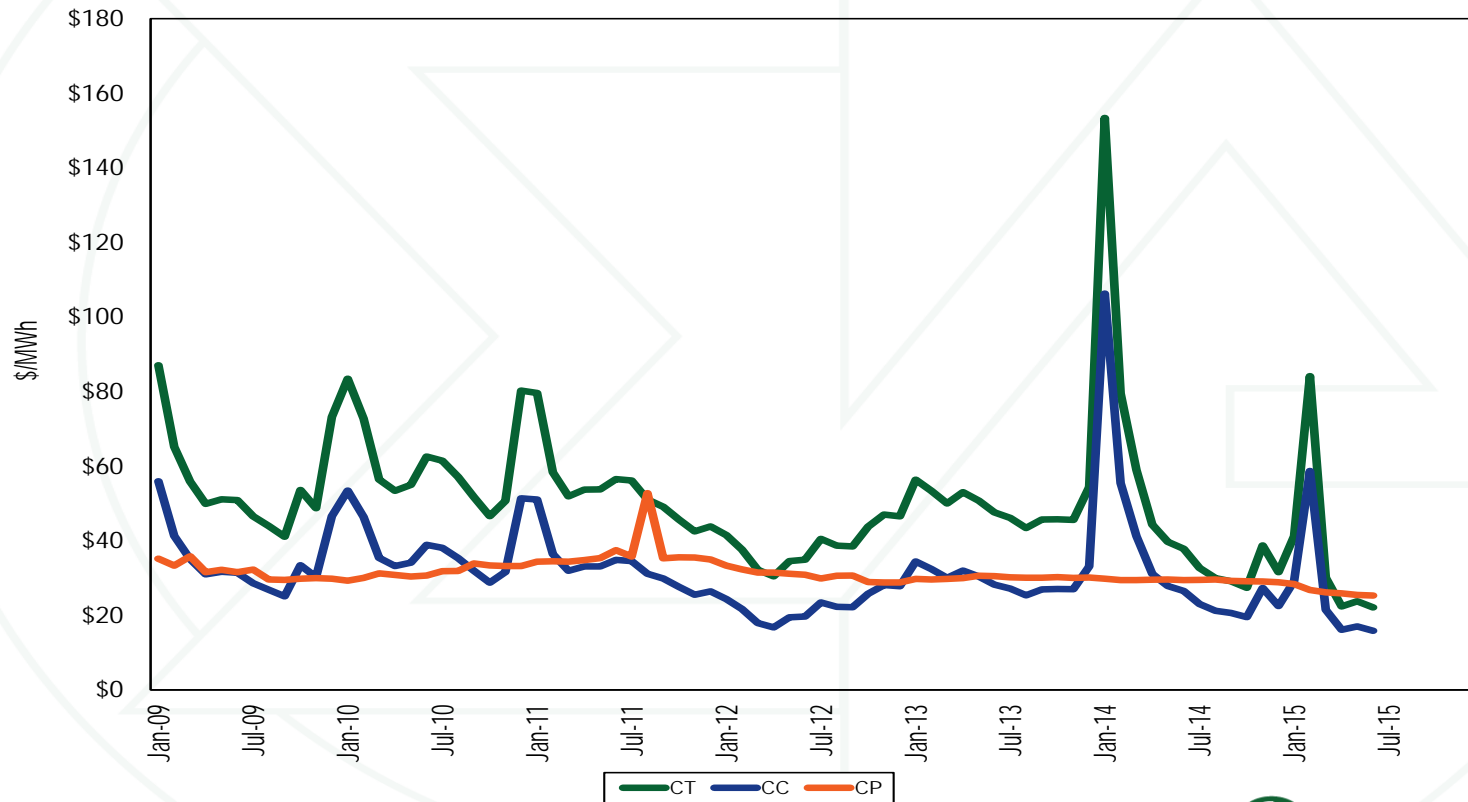


Table 3-65 PJM real-time annual, fuel-cost adjusted, load-weighted average LMP (Dollars per MWh): six months over six months

	2015 Load-Weighted LMP	2015 Fuel-Cost-Adjusted, Load-Weighted LMP	Change
Average	\$42.30	\$52.85	24.9%
	2014 Load-Weighted LMP	2015 Fuel-Cost-Adjusted, Load-Weighted LMP	Change
Average	\$69.92	\$52.85	(24.4%)
	2014 Load-Weighted LMP	2015 Load-Weighted LMP	Change
Average	\$69.92	\$42.30	(39.5%)

Table 3-8 PJM generation (By fuel source (GWh)): January through June of 2014 and 2015

		Jan-Jun 2014		Jan-Jun 2015		Change in Output
		GWh	Percent	GWh	Percent	
Coal		186,497.4	45.8%	156,026.8	39.4%	(16.3%)
	Standard Coal	184,552.9	45.3%	154,324.2	39.0%	(16.4%)
	Waste Coal	1,944.5	0.5%	1,702.6	0.4%	(12.4%)
Nuclear		134,954.5	33.1%	136,978.9	34.6%	1.5%
Gas		65,564.7	16.1%	84,695.5	21.4%	29.2%
	Natural Gas	63,810.4	15.7%	82,781.3	20.9%	29.7%
	Landfill Gas	1,183.3	0.3%	1,237.3	0.3%	4.6%
	Biomass Gas	571.0	0.1%	676.9	0.2%	18.5%
Hydroelectric		8,241.9	2.0%	6,585.4	1.7%	(20.1%)
	Pumped Storage	3,451.6	0.8%	2,696.9	0.7%	(21.9%)
	Run of River	4,790.3	1.2%	3,888.5	1.0%	(18.8%)
Wind		8,678.0	2.1%	8,760.8	2.2%	1.0%
Waste		2,334.9	0.6%	2,252.8	0.6%	(3.5%)
	Solid Waste	2,027.2	0.5%	1,988.8	0.5%	(1.9%)
	Miscellaneous	307.7	0.1%	264.1	0.1%	(14.2%)
Oil		809.0	0.2%	597.5	0.2%	(26.1%)
	Heavy Oil	340.8	0.1%	408.6	0.1%	19.9%
	Light Oil	374.3	0.1%	140.6	0.0%	(62.4%)
	Diesel	70.4	0.0%	46.6	0.0%	(33.8%)
	Kerosene	23.5	0.0%	1.7	0.0%	(92.7%)
	Jet Oil	0.0	0.0%	0.0	0.0%	NA
Solar, Net Energy Metering		201.4	0.0%	262.1	0.0%	30.1%
Battery		5.4	0.0%	2.7	0.0%	(50.1%)
Total		407,287.2	100.0%	396,162.5	100.0%	(2.7%)

Figure 5-1 Percentage of PJM installed capacity (By fuel source): June 1, 2007 through June 1, 2017

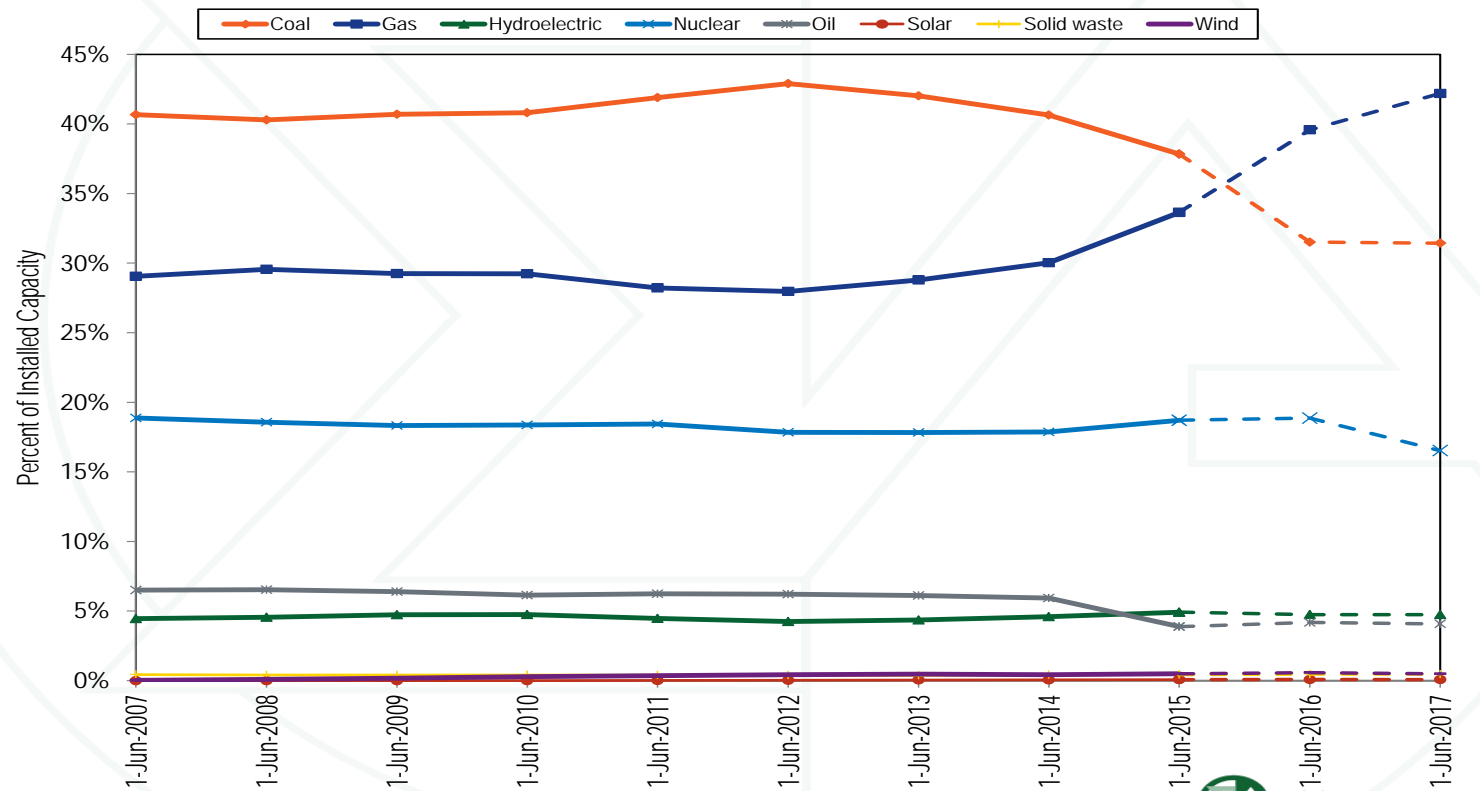


Table 3-21 Offer-capping statistics – energy only: January through June, 2011 to 2015

(Jan-Jun)	Real Time		Day Ahead	
	Unit Hours Capped	MW Capped	Unit Hours Capped	MW Capped
2011	0.7%	0.3%	0.0%	0.0%
2012	1.0%	0.5%	0.1%	0.1%
2013	0.3%	0.1%	0.1%	0.0%
2014	0.7%	0.3%	0.2%	0.1%
2015	0.5%	0.2%	0.2%	0.2%

Table 3-68 Components of PJM real-time (Adjusted), six month, load-weighted, average LMP: January through June 2014 and 2015

Element	2014 (Jan - Jun)		2015 (Jan - Jun)		Change
	Contribution to LMP	Percent	Contribution to LMP	Percent	Percent
Coal	\$17.39	24.9%	\$17.27	40.8%	16.0%
Gas	\$26.93	38.5%	\$12.78	30.2%	(8.3%)
VOM	\$2.79	4.0%	\$2.66	6.3%	2.3%
Markup	\$4.61	6.6%	\$2.42	5.7%	(0.9%)
Oil	\$5.32	7.6%	\$2.30	5.4%	(2.2%)
Ten Percent Adder	\$3.35	4.8%	\$1.78	4.2%	(0.6%)
Ancillary Service Redispatch Cost	\$0.76	1.1%	\$1.27	3.0%	1.9%
LPA Rounding Difference	(\$0.11)	(0.2%)	\$0.80	1.9%	2.1%
NA	\$2.73	3.9%	\$0.67	1.6%	(2.3%)
Increase Generation Adder	\$1.23	1.8%	\$0.36	0.9%	(0.9%)
CO ₂ Cost	\$0.20	0.3%	\$0.26	0.6%	0.3%
Other	\$0.03	0.0%	\$0.06	0.1%	0.1%
NO _x Cost	\$0.13	0.2%	\$0.03	0.1%	(0.1%)
SO ₂ Cost	\$0.01	0.0%	\$0.01	0.0%	0.0%
Market-to-Market Adder	(\$0.01)	(0.0%)	\$0.01	0.0%	0.0%
FMU Adder	\$1.01	1.5%	\$0.00	0.0%	(1.4%)
Emergency DR Adder	\$3.63	5.2%	\$0.00	0.0%	(5.2%)
Scarcity Adder	\$0.20	0.3%	\$0.00	0.0%	(0.3%)
Constraint Violation Adder	\$0.00	0.0%	(\$0.00)	(0.0%)	(0.0%)
Uranium	(\$0.02)	(0.0%)	(\$0.00)	(0.0%)	0.0%
Wind	(\$0.02)	(0.0%)	(\$0.06)	(0.1%)	(0.1%)
Decrease Generation Adder	(\$0.26)	(0.4%)	(\$0.08)	(0.2%)	0.2%
LPA-SCED Differential	(\$0.01)	(0.0%)	(\$0.10)	(0.2%)	(0.2%)
Municipal Waste	\$0.03	0.0%	(\$0.15)	(0.4%)	(0.4%)
Total	\$69.92	100.0%	\$42.30	100.0%	0.0%

Table 11-8 Total PJM congestion (Dollars (Millions)): January through June of 2008 through 2015

Congestion Costs (Millions)				
(Jan - Jun)	Congestion Cost	Percent Change	Total PJM Billing	Percent of PJM Billing
2008	\$1,166	NA	\$16,549	7.0%
2009	\$408	(65.0%)	\$13,457	3.0%
2010	\$644	57.8%	\$16,314	3.9%
2011	\$570	(11.5%)	\$18,685	3.1%
2012	\$263	(53.8%)	\$13,991	1.9%
2013	\$306	16.3%	\$15,571	2.0%
2014	\$1,442	371.3%	\$31,060	4.6%
2015	\$919	(36.3%)	\$23,400	3.9%

Figure 11-1 PJM monthly total congestion cost (Dollars (Millions)): 2009 through June of 2015

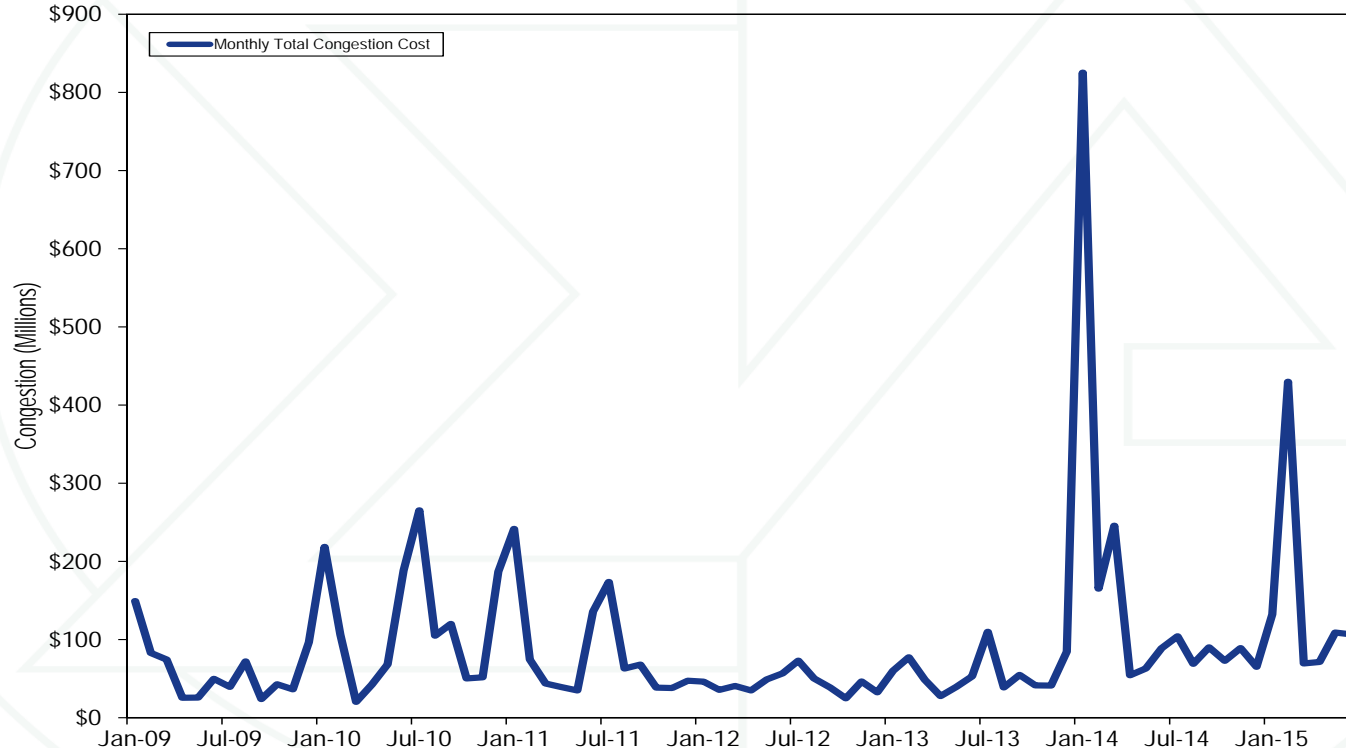


Table 5-3 PJM installed capacity (By fuel source): January 1, May 31, June 1, and June 30, 2015

	1-Jan-15 MW	Percent	31-May-15 MW	Percent	1-Jun-15 MW	Percent	30-Jun-15 MW	Percent
Coal	72,741.3	39.6%	72,343.5	39.5%	66,878.1	37.8%	66,878.1	37.8%
Gas	59,662.6	32.5%	59,862.3	32.7%	59,460.1	33.6%	59,463.1	33.6%
Hydroelectric	8,765.3	4.8%	8,690.8	4.7%	8,698.8	4.9%	8,698.9	4.9%
Nuclear	32,947.1	17.9%	33,078.4	18.1%	33,071.5	18.7%	33,071.5	18.7%
Oil	7,907.6	4.3%	7,299.7	4.0%	6,853.4	3.9%	6,853.4	3.9%
Solar	97.5	0.1%	97.5	0.1%	128.0	0.1%	128.0	0.1%
Solid waste	781.9	0.4%	781.9	0.4%	771.3	0.4%	771.3	0.4%
Wind	822.7	0.4%	822.7	0.4%	876.2	0.5%	876.2	0.5%
Total	183,726.0	100.0%	182,976.8	100.0%	176,737.4	100.0%	176,740.5	100.0%

Figure 5-4 Trends in the PJM equivalent demand forced outage rate (EFORd): 2007 through 2015

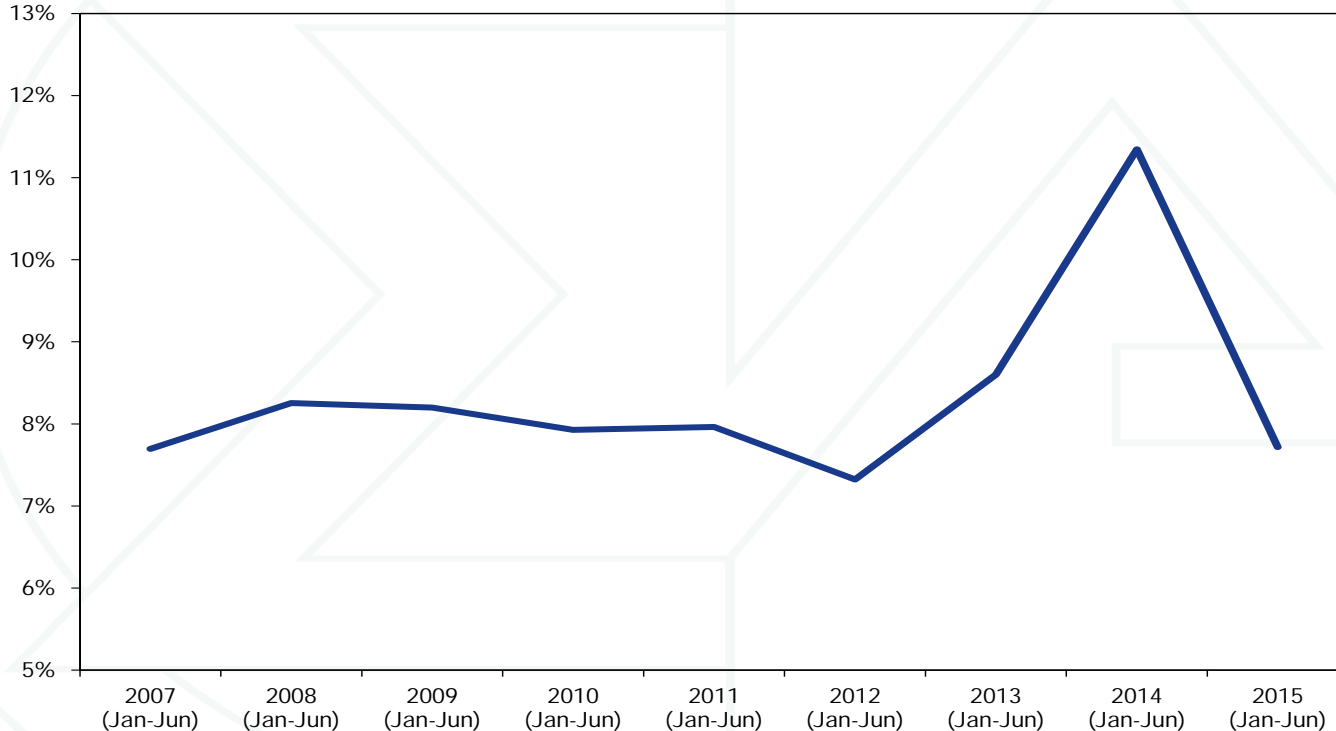


Table 5-18 PJM EFORd, XEFORd and EFORp data by unit type⁶⁵

	EFORd	XEFORd	EFORp	Difference EFORd and XEFORd	Difference EFORd and EFORp
Combined Cycle	3.0%	3.0%	1.5%	0.0%	1.5%
Combustion Turbine	12.8%	11.7%	8.2%	1.1%	4.6%
Diesel	10.9%	10.0%	5.0%	0.9%	5.9%
Hydroelectric	1.6%	1.4%	1.8%	0.1%	(0.2%)
Nuclear	1.2%	1.1%	0.7%	0.1%	0.4%
Steam	10.6%	10.5%	7.1%	0.1%	3.5%
Total	7.7%	7.5%	5.0%	0.3%	2.7%

Figure 5-5 PJM distribution of EFORd data by unit type

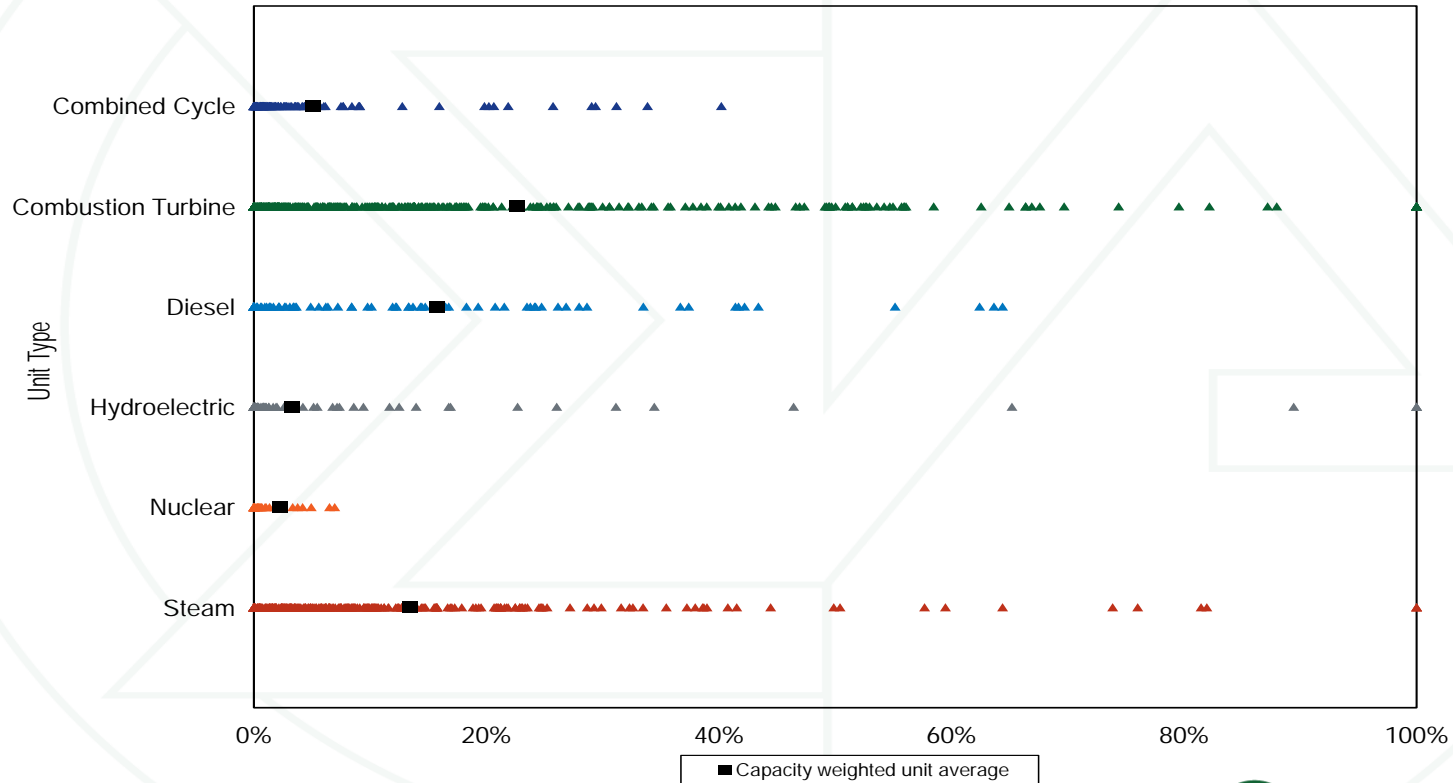


Table 12-6 Summary of PJM unit retirements by fuel (MW): 2011 through 2019

	Coal	Diesel	Heavy Oil	Kerosene	Landfill Gas	Light Oil	Natural Gas	Nuclear	Wood Waste	Total
Retirements 2011	543.0	0.0	0.0	0.0	0.0	63.7	522.5	0.0	0.0	1,129.2
Retirements 2012	5,907.9	0.0	0.0	0.0	0.0	788.0	250.0	0.0	16.0	6,961.9
Retirements 2013	2,589.9	2.9	166.0	0.0	3.8	85.0	0.0	0.0	8.0	2,855.6
Retirements 2014	2,427.0	50.0	0.0	184.0	15.3	0.0	294.0	0.0	0.0	2,970.3
Retirements 2015	7,537.8	4.0	0.0	644.2	0.0	212.0	1,319.0	0.0	0.0	9,717.0
Planned Retirements 2015	124.0	6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	130.3
Planned Retirements Post-2015	1,811.0	8.0	108.0	0.0	0.0	0.0	661.8	614.5	0.0	3,203.3
Total	20,940.6	71.2	274.0	828.2	19.1	1,148.7	3,047.3	614.5	24.0	26,967.6

Figure 12-1 Map of PJM unit retirements: 2011 through 2019

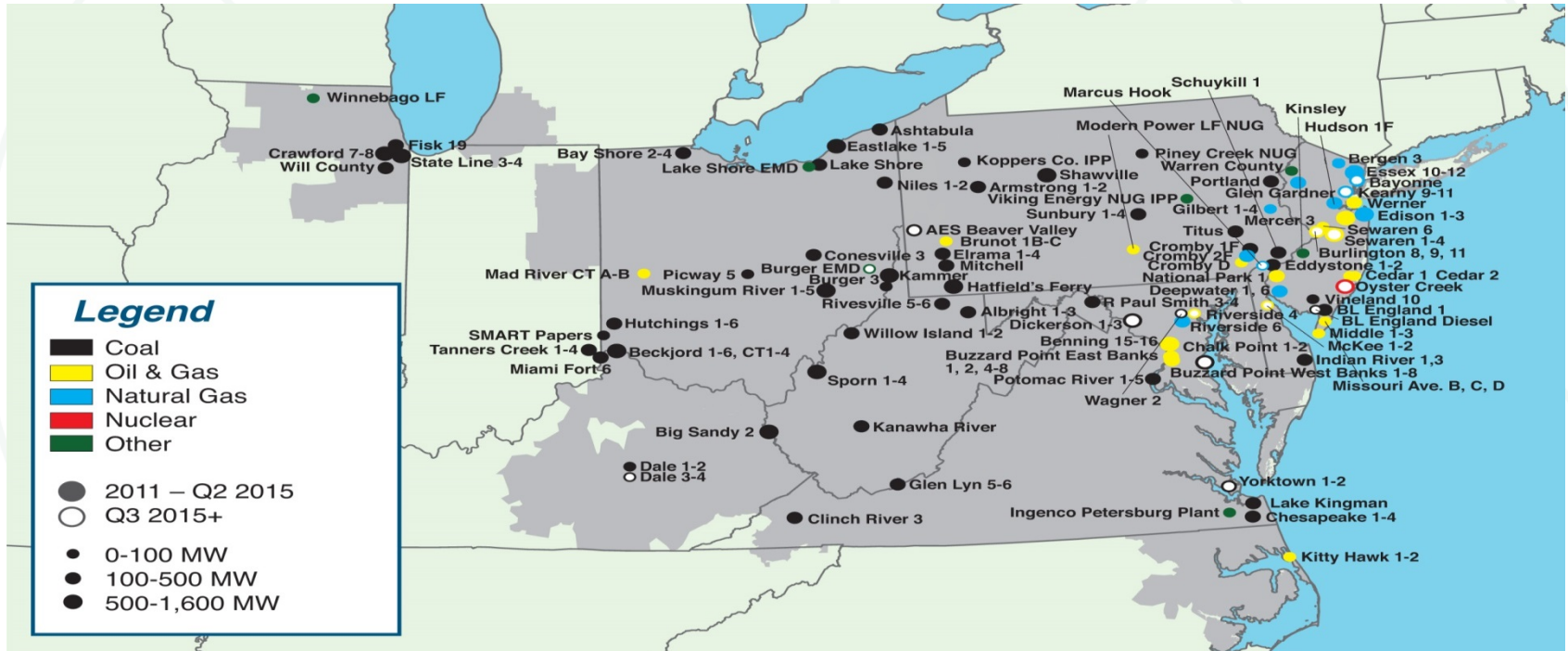


Table 4-3 Total energy uplift charges: January through June 2014 and 2015

	Charges (Millions)	Charges (Millions)	Change	Percent Change
Total Energy Uplift	\$831.5	\$241.4	(\$590.1)	(71.0%)
Energy Uplift as a Percent of Total PJM Billing	2.7%	1.0%	(1.6%)	(61.4%)

Figure 4-8 Energy uplift charges change from April through June of 2014 to April through June of 2015 by category

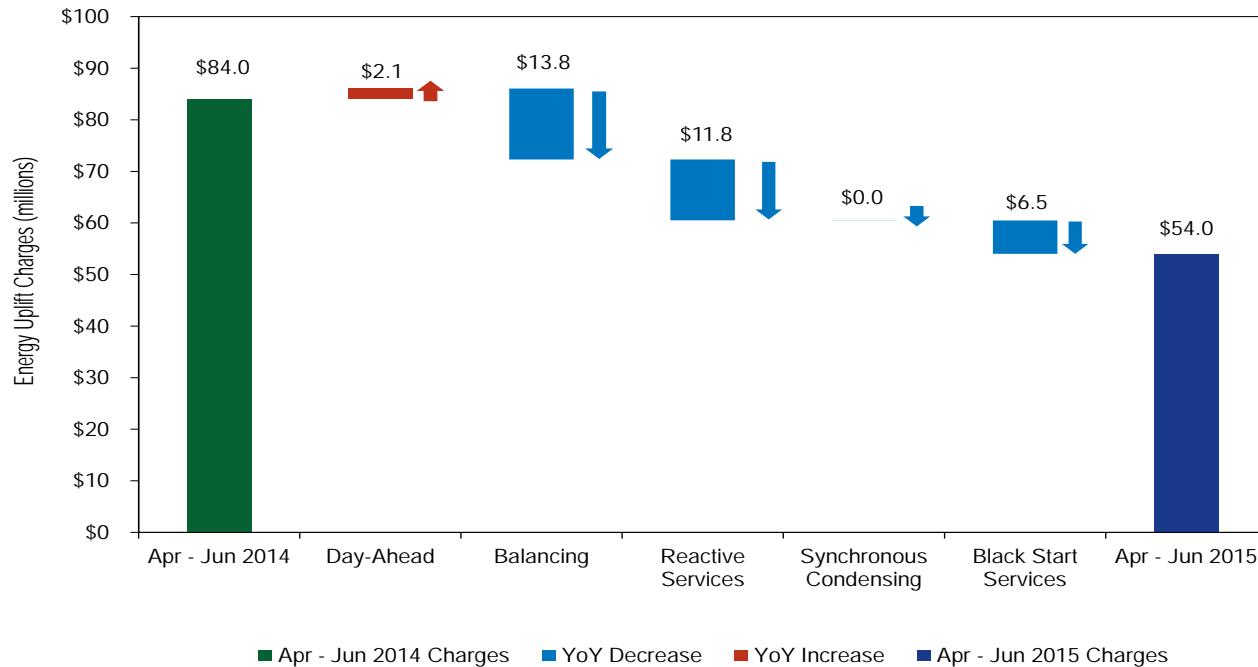


Table 4-13 Operating reserve rates statistics (\$/MWh): January through June 2015

Region	Transaction	Rates Charged (\$/MWh)			Standard Deviation
		Maximum	Average	Minimum	
East	INC	17.344	1.690	0.020	2.512
	DEC	17.602	1.858	0.240	2.582
	DA Load	1.600	0.167	0.000	0.210
	RT Load	0.773	0.066	0.000	0.116
	Deviation	17.344	1.690	0.020	2.512
West	INC	17.344	1.649	0.020	2.482
	DEC	17.602	1.816	0.208	2.556
	DA Load	1.600	0.167	0.000	0.210
	RT Load	0.772	0.057	0.000	0.109
	Deviation	17.344	1.649	0.020	2.482

Table 4-39 Current and proposed average energy uplift rate by transaction:2014 and January through June 2015

		2014			Jan - Jun 2015		
Transaction		Current Rates (\$/MWh)	Proposed Rates - 50% UTC (\$/MWh)	Proposed Rates - 0% UTC (\$/MWh)	Current Rates (\$/MWh)	Proposed Rates - 50% UTC (\$/MWh)	Proposed Rates - 0% UTC (\$/MWh)
East	INC	2.296	0.223	0.701	1.690	0.236	0.587
	DEC	2.426	0.223	0.701	1.858	0.236	0.587
	DA Load	0.129	0.019	0.024	0.167	0.017	0.020
	RT Load	0.450	0.460	0.460	0.066	0.175	0.175
	Deviation	2.296	1.313	1.787	1.690	0.740	1.088
West	INC	2.091	0.185	0.586	1.649	0.234	0.595
	DEC	2.220	0.185	0.586	1.816	0.234	0.595
	DA Load	0.129	0.019	0.024	0.167	0.017	0.020
	RT Load	0.439	0.460	0.460	0.057	0.175	0.175
	Deviation	2.091	1.229	1.626	1.649	0.659	1.017
UTC	East to East	NA	0.447	1.402	NA	0.472	1.175
	West to West	NA	0.370	1.173	NA	0.469	1.190
	East to/from West	NA	0.408	1.287	NA	0.471	1.183

Figure 6-2 Economic program credits and MWh by month: January 2010 through June 2015

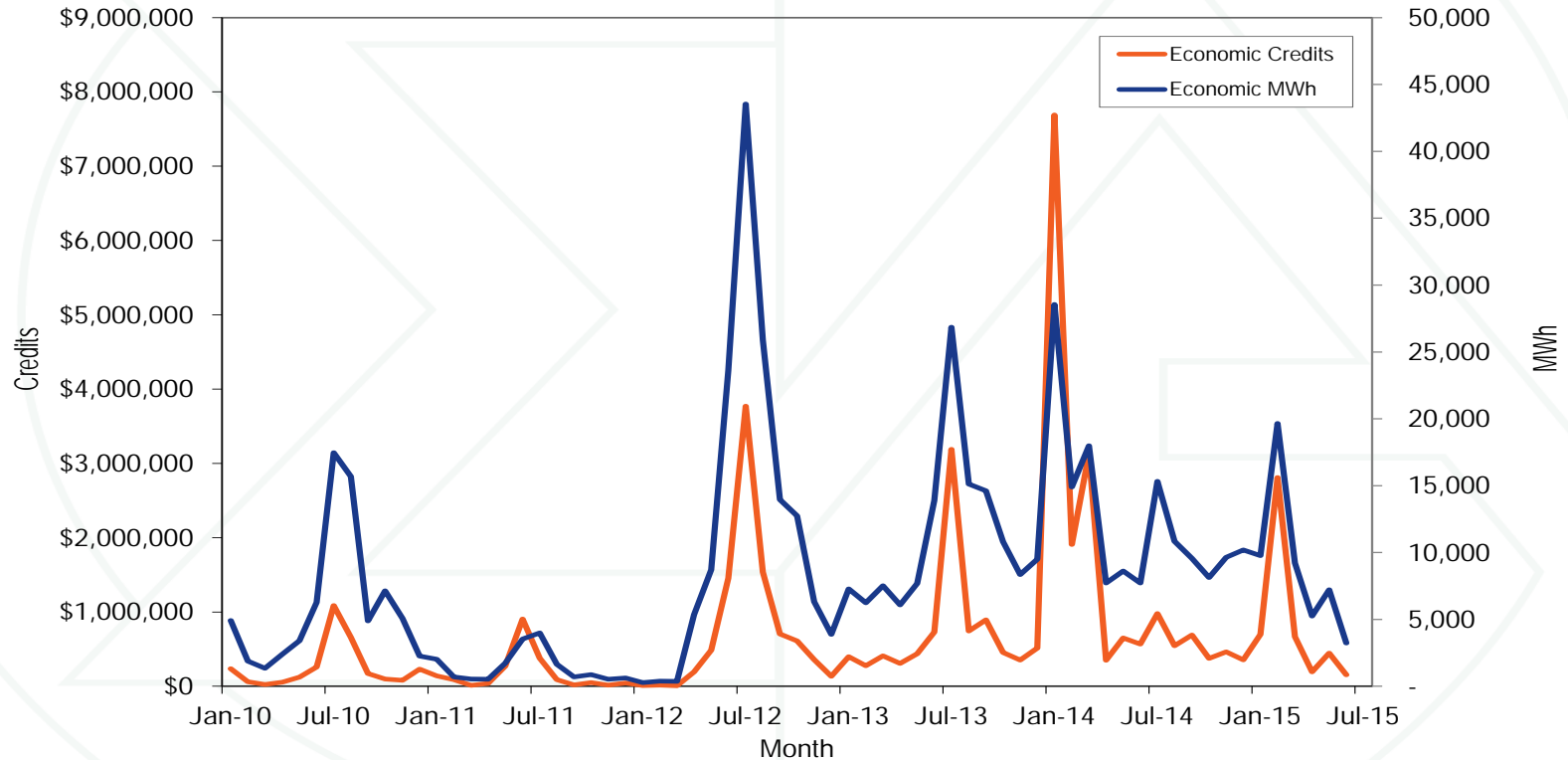


Figure 6-1 Demand response revenue by market: January through June 2008 through 2015

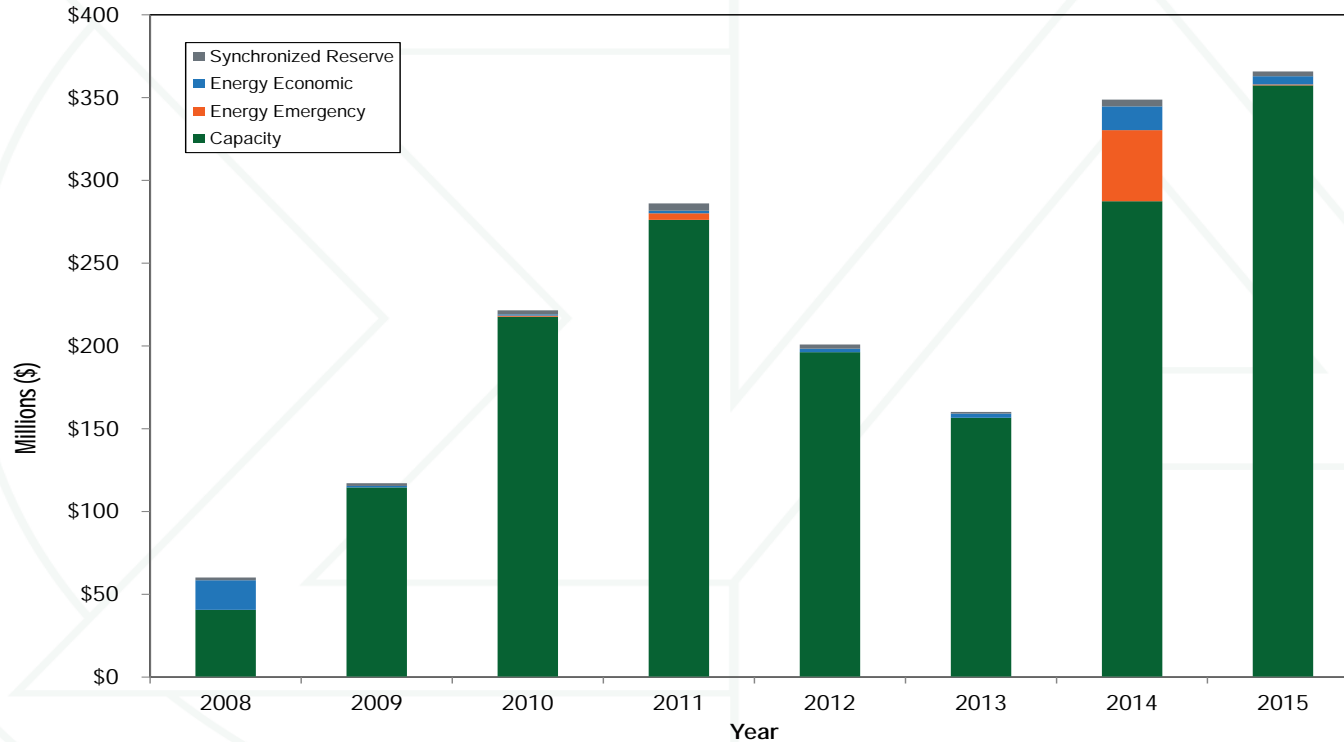


Figure 9-3 PJM's footprint and its external interfaces

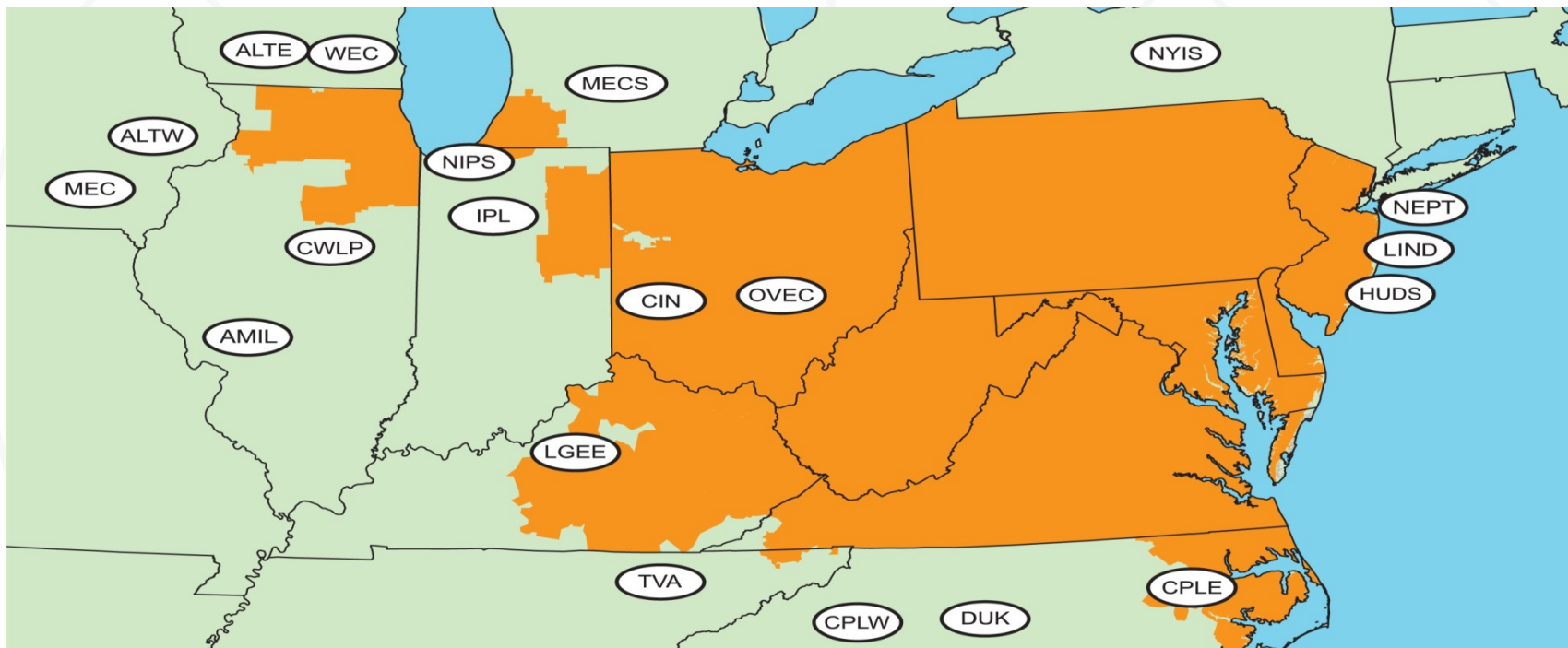


Figure 9-2 PJM real-time and day-ahead scheduled import and export transaction volume history: January, 1999, through June, 2015

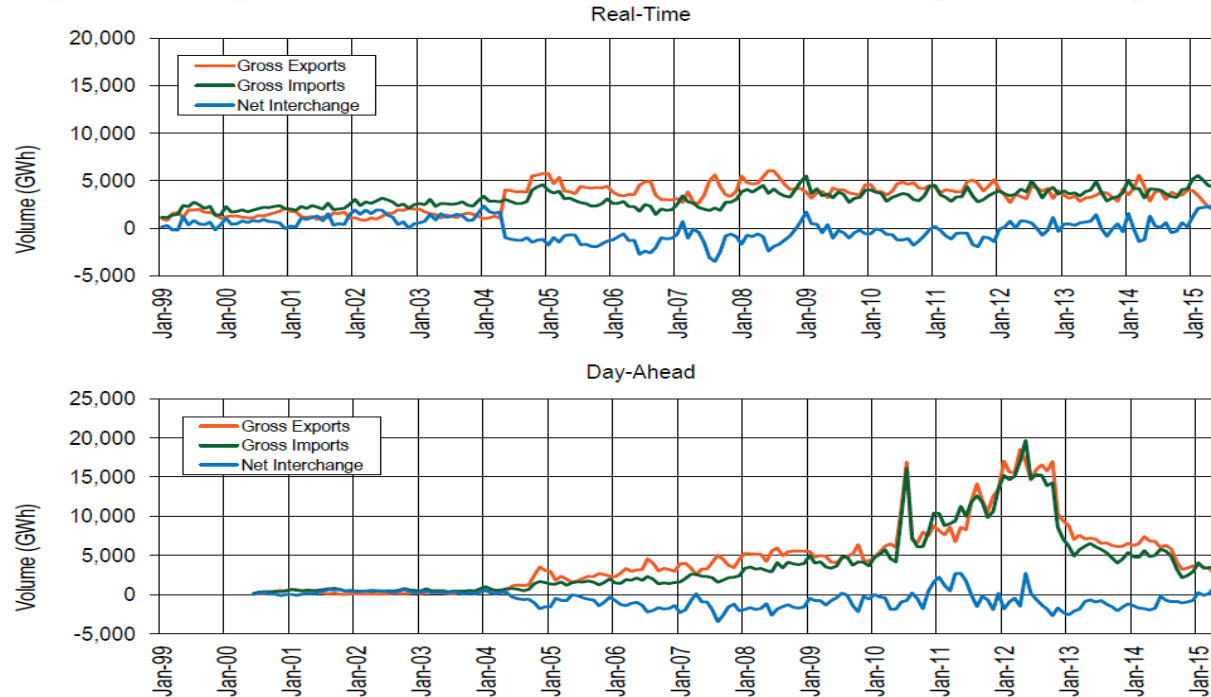


Table 10-4 History of ancillary services costs per MWh of Load: January through June, 2004 through 2015

Year	Regulation	Scheduling, Dispatch, and System Control	Reactive	Synchronized Reserve	Supplementary Operating Reserve	Total
2004	\$0.53	\$0.66	\$0.26	\$0.16	\$0.93	\$2.53
2005	\$0.57	\$0.51	\$0.27	\$0.11	\$0.60	\$2.05
2006	\$0.48	\$0.48	\$0.29	\$0.08	\$0.32	\$1.65
2007	\$0.61	\$0.46	\$0.30	\$0.09	\$0.50	\$1.95
2008	\$0.73	\$0.37	\$0.30	\$0.08	\$0.66	\$2.14
2009	\$0.37	\$0.43	\$0.37	\$0.04	\$0.50	\$1.71
2010	\$0.37	\$0.38	\$0.36	\$0.06	\$0.75	\$1.92
2011	\$0.33	\$0.38	\$0.41	\$0.11	\$0.80	\$2.03
2012	\$0.20	\$0.44	\$0.47	\$0.03	\$0.65	\$1.79
2013	\$0.26	\$0.41	\$0.65	\$0.03	\$0.73	\$2.09
2014	\$0.46	\$0.41	\$0.42	\$0.36	\$2.07	\$3.71
2015	\$0.29	\$0.41	\$0.38	\$0.16	\$0.57	\$1.81

Table 10-7 MW credited, price, cost, and all-in price for primary reserve and its component products, full RTO Reserve Zone, January through June 2015

Product	Share of Primary Reserve Requirement	MW Credited	Credits Paid	Price Per MW	Cost Per MW	All-In Cost
Tier 1 Synchronized Reserve Response	NA	4,460	\$193,736	NA	\$43.44	\$0.00
Tier 1 Synchronized Reserve	21.5%	1,340,635	\$25,816,250	\$19.26	\$19.26	\$0.07
Tier 2 Synchronized Reserve	24.0%	1,491,685	\$36,438,890	\$14.16	\$24.43	\$0.09
Non-synchronized Reserve	54.5%	3,390,118	\$8,242,932	\$1.51	\$2.43	\$0.02
Primary Reserve	100.0%	6,222,438	\$70,498,072	\$8.36	\$11.33	\$0.18

Figure 10-30 PJM regulation market daily weighted average market-clearing price, marginal unit opportunity cost and offer price (Dollars per MW): 2015

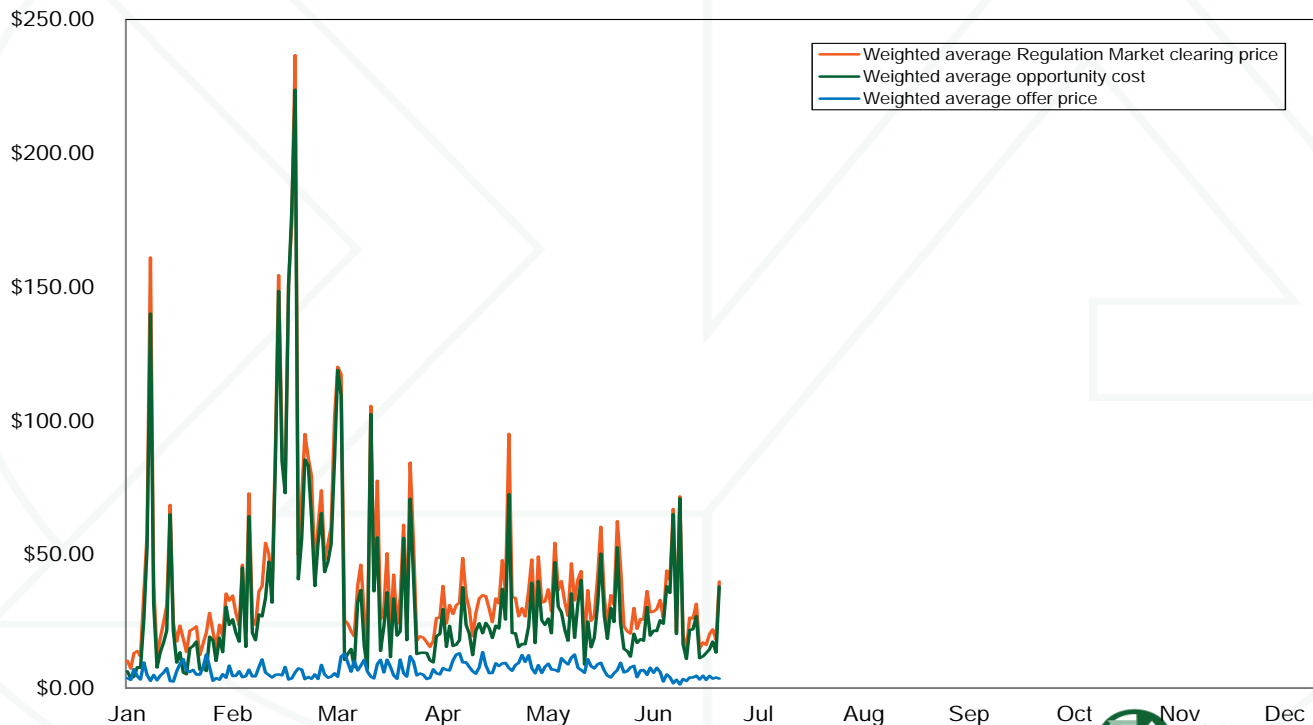


Table 10-38 Comparison of average price and cost for PJM Regulation, January through June, 2009 through 2015

Year (Jan-Jun)	Weighted Regulation Market Price	Weighted Regulation Market Cost	Regulation Price as Percent Cost
2009	\$23.56	\$29.87	79%
2010	\$18.05	\$30.67	59%
2011	\$15.31	\$31.00	49%
2012	\$13.89	\$18.34	76%
2013	\$32.04	\$37.04	87%
2014	\$62.70	\$75.96	83%
2015	\$40.94	\$49.57	83%

Table 10-37 Components of regulation cost: 2015

Month	Scheduled Regulation (MW)	Cost of Regulation Capability (\$/MW)	Cost of Regulation Performance (\$/MW)	Opportunity Cost (\$/MW)	Total Cost (\$/MW)
Jan	394,350.5	\$24.34	\$3.82	\$4.94	\$33.10
Feb	356,397.3	\$69.13	\$5.98	\$14.00	\$89.11
Mar	394,659.1	\$41.41	\$6.19	\$7.86	\$55.46
Apr	378,682.3	\$28.42	\$6.07	\$4.79	\$39.29
May	395,717.3	\$39.63	\$5.02	\$8.50	\$53.15
Jun	382,956.8	\$23.58	\$3.40	\$3.17	\$30.15

Table 10-12 Tier 1 compensation as currently implemented by PJM

Hourly Parameters	Tier 1 Compensation by Type of Hour as Currently Implemented by PJM	
	No Synchronized Reserve Event	Synchronized Reserve Event
NSRMCP=\$0	T1 credits = \$0	T1 credits = Synchronized Energy Premium Price * actual response MWh
NSRMCP>\$0	T1 credits = T2 SRMCP * calculated tier 1 MW	T1 credits = T2 SRMCP * min(calculated tier 1 MW, actual response MWh)

Table 10-10 Weighted price of tier 1 synchronized reserve attributable to a non-synchronized reserve price above zero: January 2014 to June 2015

Year	Month	Total Hours When NSRMCP>\$0	Weighted Average SRMCP for Hours When NSRMCP>\$0	Total Tier 1 MW Credited for Hours When NSRMCP>\$0	Total Tier 1 Credits Paid When NSRMCP>\$0	Average Tier 1 MW Paid
2014	Jan	155	\$93.26	706,479	\$64,956,018	4,557.9
2014	Feb	15	\$40.18	65,332	\$2,625,303	4,355.4
2014	Mar	67	\$44.56	240,625	\$10,665,198	3,591.4
2014	Apr	99	\$16.07	308,759	\$4,959,232	3,118.8
2014	May	61	\$15.85	253,076	\$4,012,285	4,148.8
2014	Jun	4	\$35.46	15,970	\$566,292	3,992.4
2014	Jul	5	\$17.02	9,150	\$155,744	1,829.9
2014	Aug	0	NA	NA	NA	NA
2014	Sep	0	NA	NA	NA	NA
2014	Oct	3	\$21.59	2,146	\$46,319	715.2
2014	Nov	28	\$15.73	38,188	\$599,147	1,363.8
2014	Dec	104	\$6.93	163,552	\$1,133,507	1,739.9
2015	Jan	148	\$13.59	274,996	\$3,727,945	1,858.1
2015	Feb	194	\$24.83	369,111	\$9,164,267	1,902.6
2015	Mar	181	\$16.33	305,967	\$4,985,446	1,690.4
2015	Apr	66	\$25.56	102,117	\$2,587,076	1,547.2
2015	May	72	\$20.35	106,027	\$2,158,080	1,472.6
2015	Jun	93	\$17.45	182,417	\$3,183,436	1,961.0
Total		1295	\$29.92	3,143,911	\$115,525,295	2,490.3

Table 10-13 Tier 1 compensation as recommended by MMU

Hourly Parameters	Tier 1 Compensation by Type of Hour as Recommended by MMU	
	No Synchronized Reserve Event	Synchronized Reserve Event
NSRMCP=\$0	T1 credits = \$0	T1 credits = Synchronized Energy Premium Price * actual response MWh
NSRMCP>\$0	T1 credits = \$0	T1 credits = Synchronized Energy Premium Price * actual response MWh

Table 10-5 Average monthly tier 1 and tier 2 synchronized reserve, plus nonsynchronized reserve used to satisfy the primary reserve requirement, MAD Subzone: January through June 2015

Year	Month	Tier 1 Total MW	Tier 2 Synchronized Reserve MW	Non- Synchronized Reserve MW
2015	Jan	1,222.0	206.9	629.7
2015	Feb	1,176.7	305.1	437.4
2015	Mar	1,200.6	288.7	394.6
2015	Apr	1,148.8	302.8	381.3
2015	May	1,217.4	238.5	387.4
2015	Jun	1,258.9	218.7	372.0
2015	Average	1,204.1	260.1	433.7

Table 10-6 Average monthly tier 1 and tier 2 synchronized reserve, and nonsynchronized reserve used to satisfy the primary reserve requirement, RTO Zone: January through June 2015

Year	Month	Tier 1 Total MW	Tier 2 Synchronized Reserve MW	Non- Synchronized Reserve MW
2015	Jan	1,582.7	331.7	1,074.4
2015	Feb	1,469.1	415.7	906.3
2015	Mar	1,247.2	424.8	928.5
2015	Apr	1,125.1	438.8	877.1
2015	May	1,245.1	373.1	811.5
2015	Jun	1,632.2	303.0	769.0
2015	Average	1,333.8	381.2	894.5

Figure 13-13 FTR payout ratio by month, excluding and including excess revenue distribution: January 2004 through June 2015

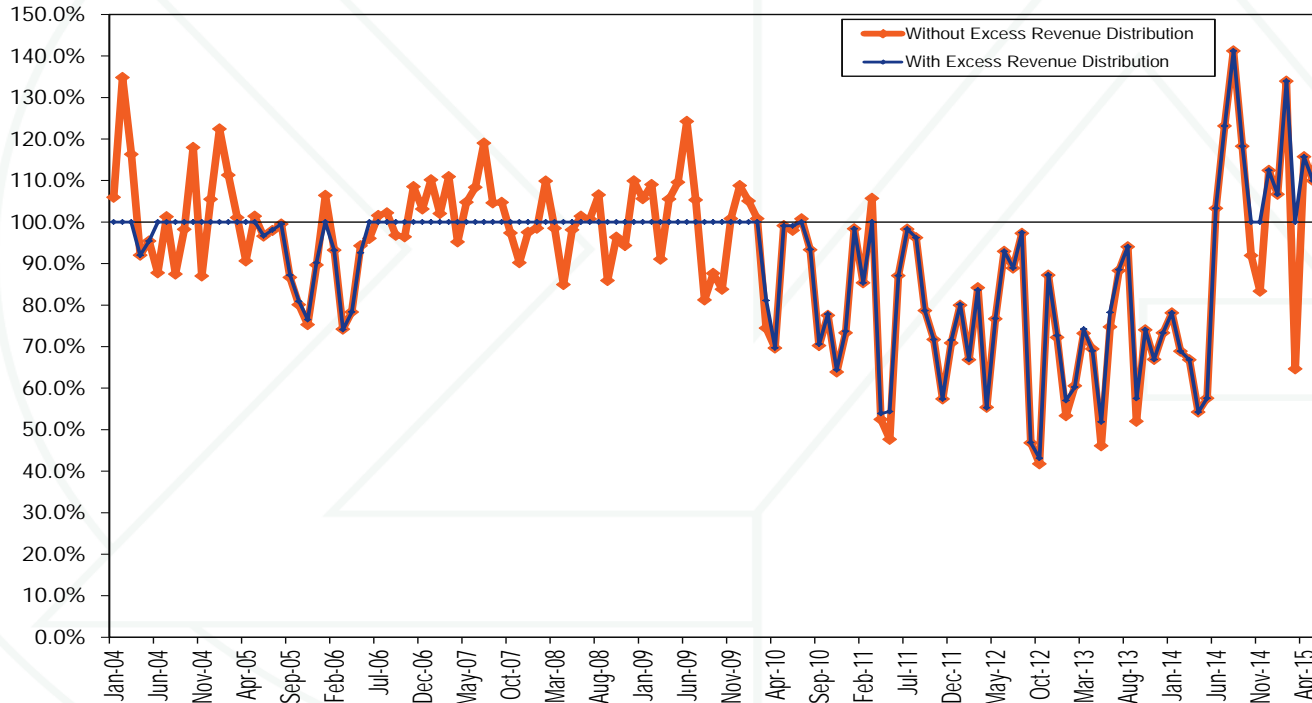


Figure 13-16 Historic Stage 1B and Stage 2 ARR Allocations from the 2011 to 2012 through 2014 to 2015 planning periods

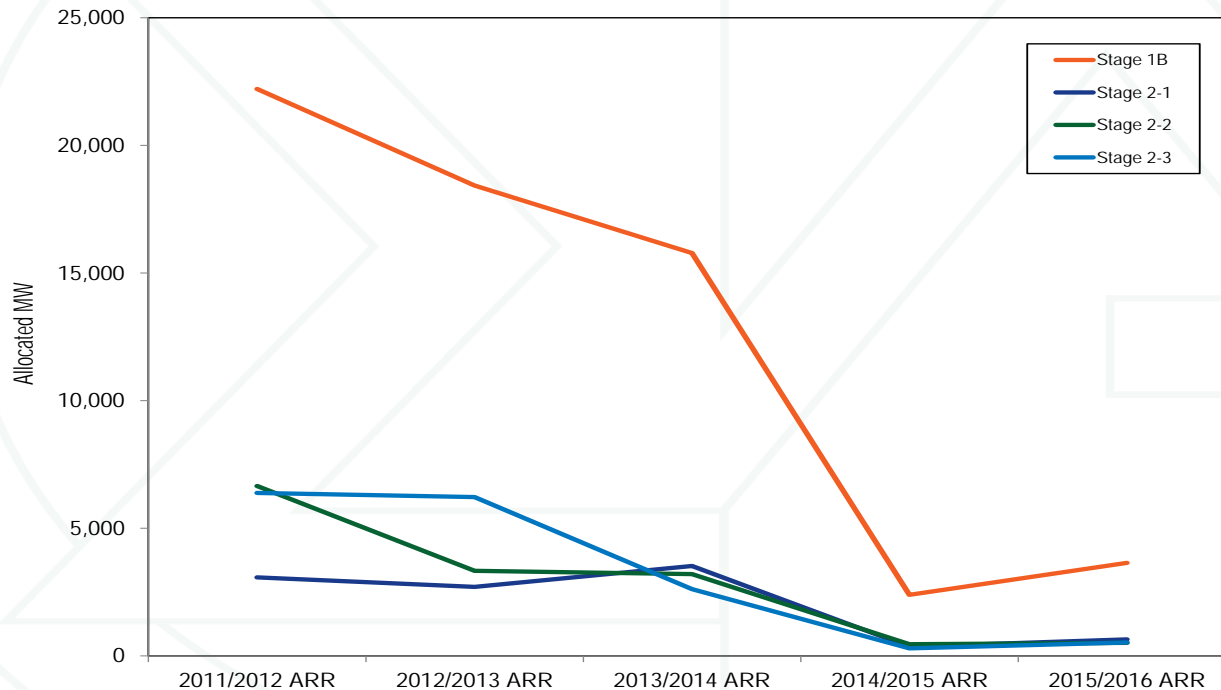


Figure 13-6 Annual Bid FTR Auction volume: Planning period 2009 to 2010 through 2015 to 2016

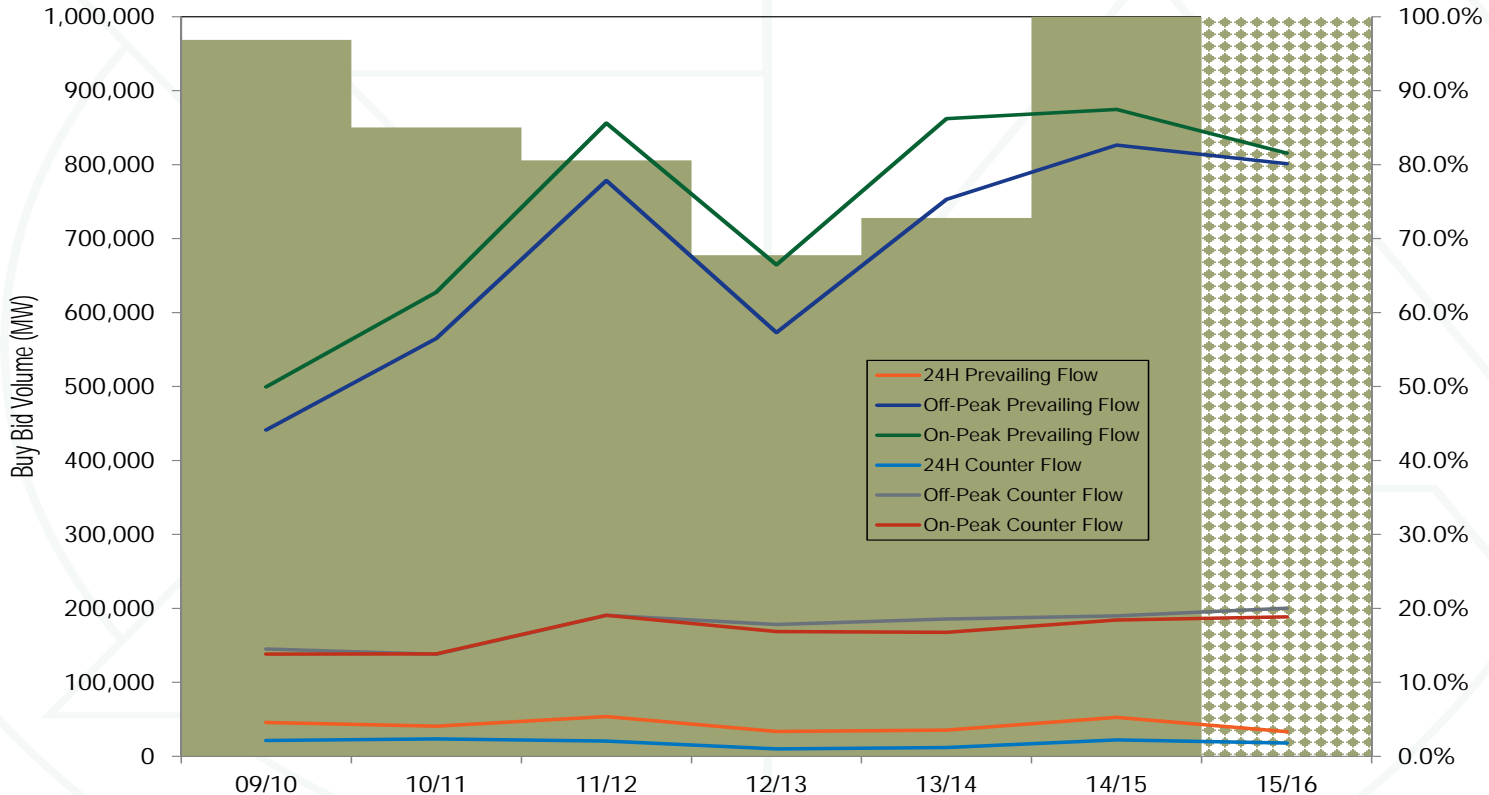


Figure 13-7 Annual Cleared FTR Auction volume: Planning period 2009 to 2010 through 2015 to 2016

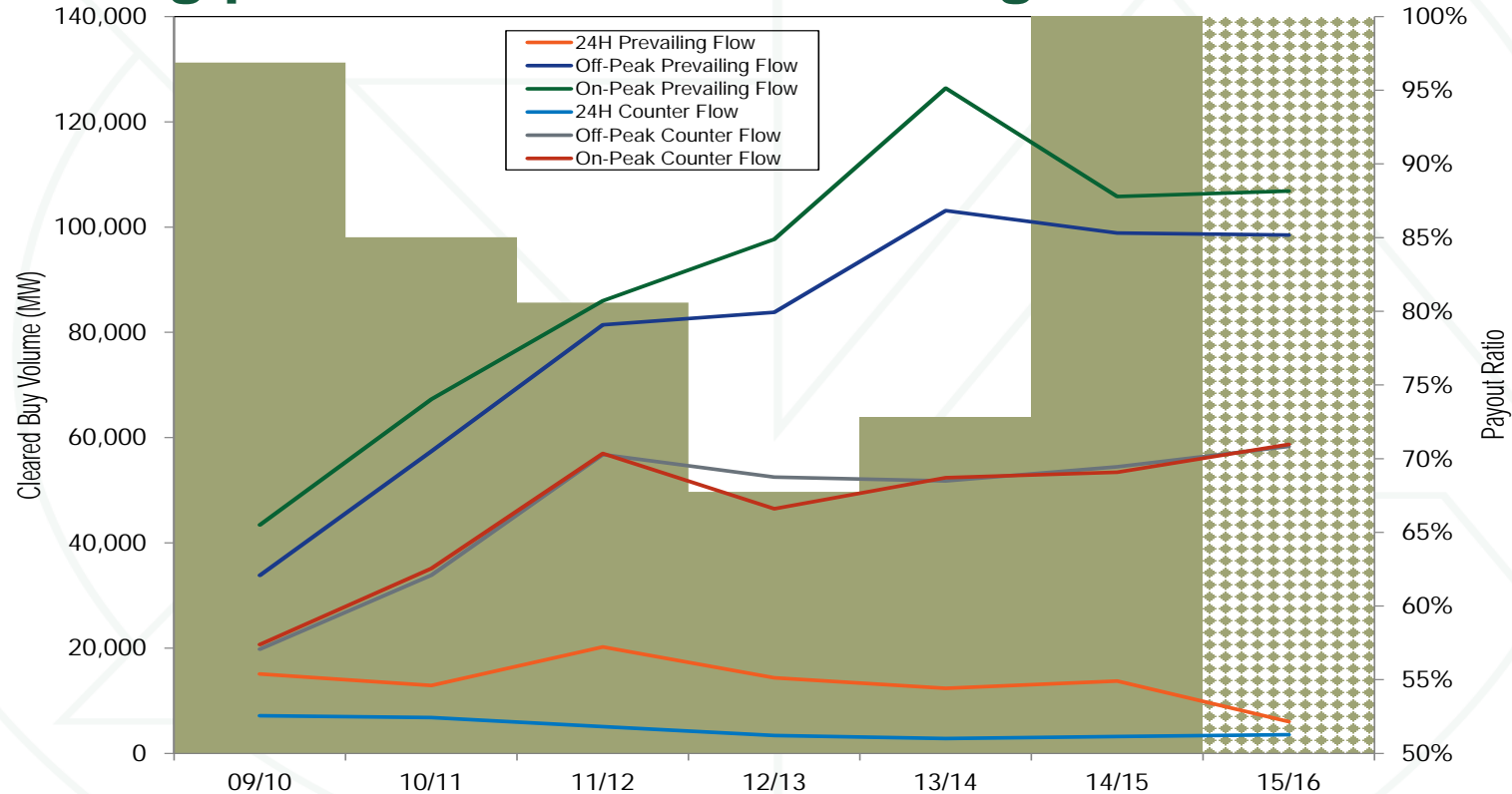


Figure 13-10 Annual FTR Auction volume-weighted average buy bid price: Planning period 2009 to 2010 through 2015 to 2016

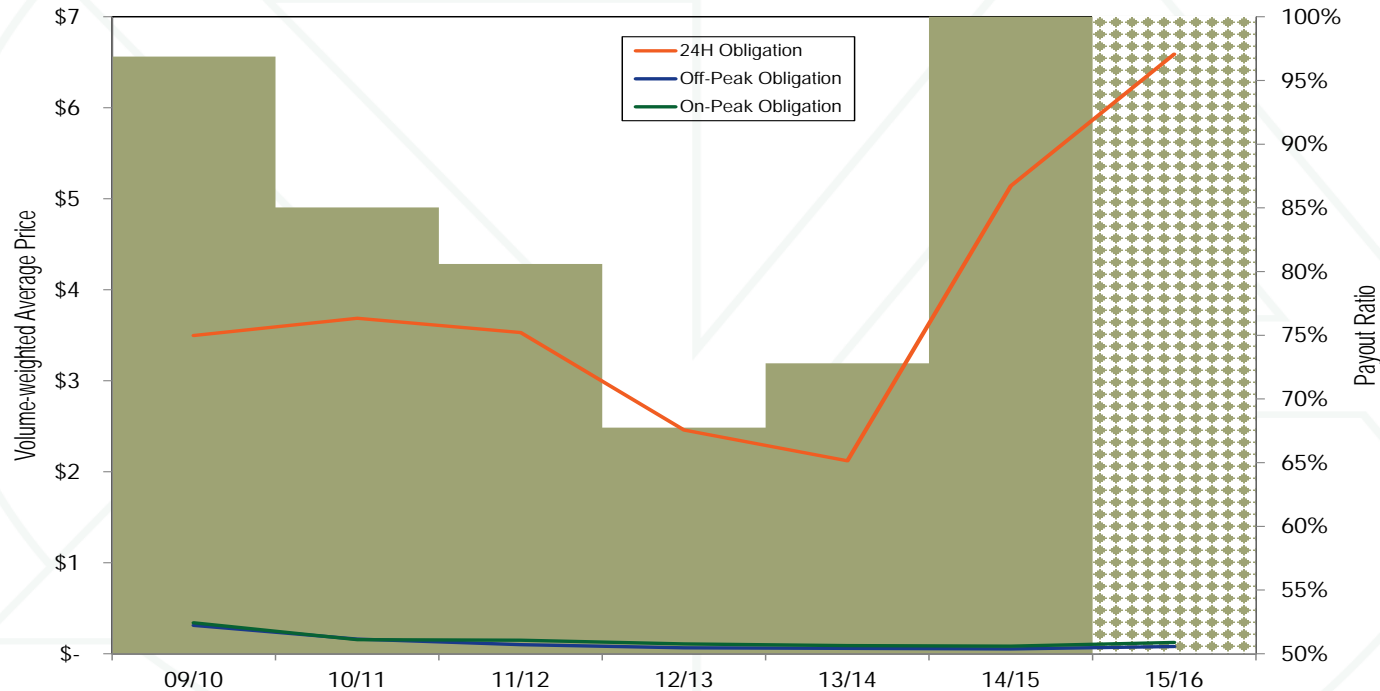


Figure 13-9 Long Term, Annual and Monthly FTR Auction bid and cleared volume: June 2003 through June 2015

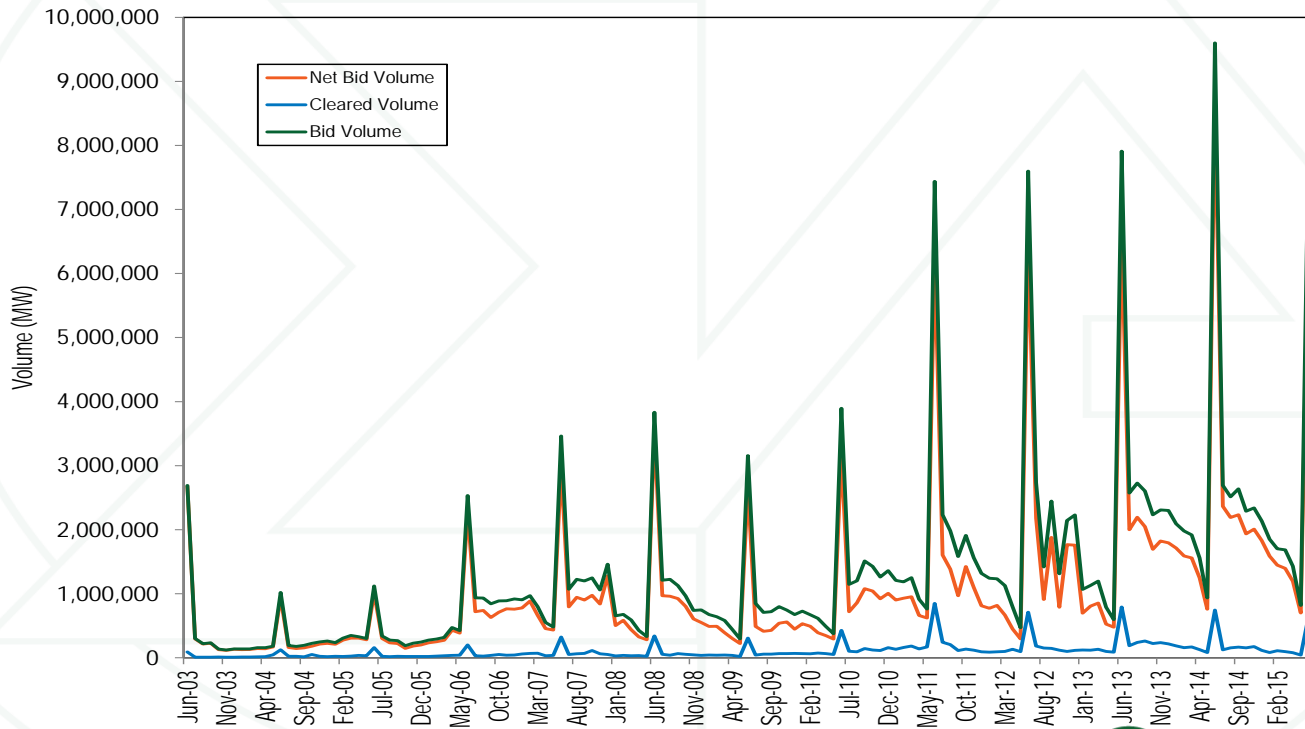


Figure 13-2 Monthly FTR forfeitures for physical and financial participants: June 2010 through May 2015

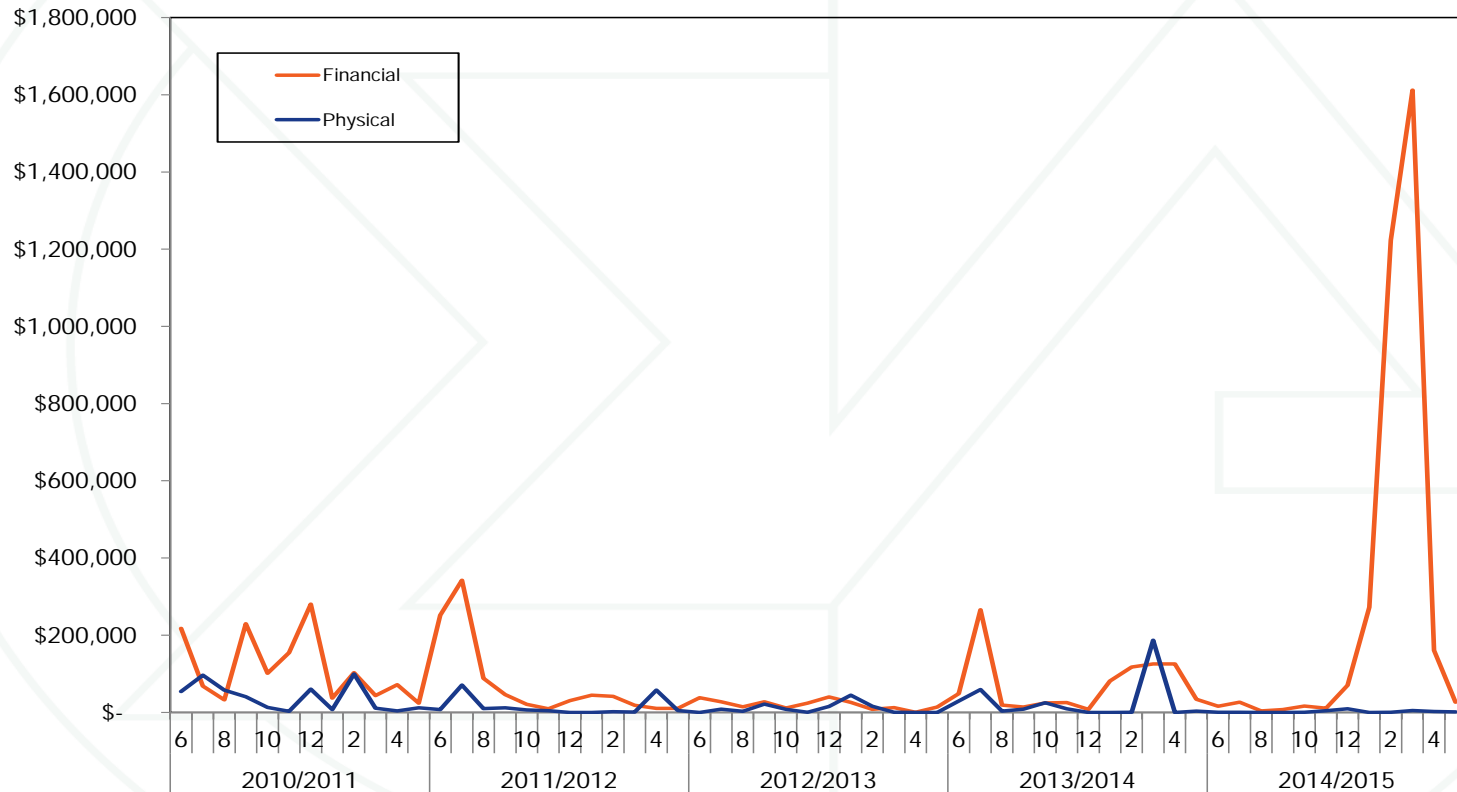


Figure 13-3 FTR forfeitures for INCs/DECs and INCs /DECs/UTCs for both the PJM and MMU methods: January 2013 through June 2015

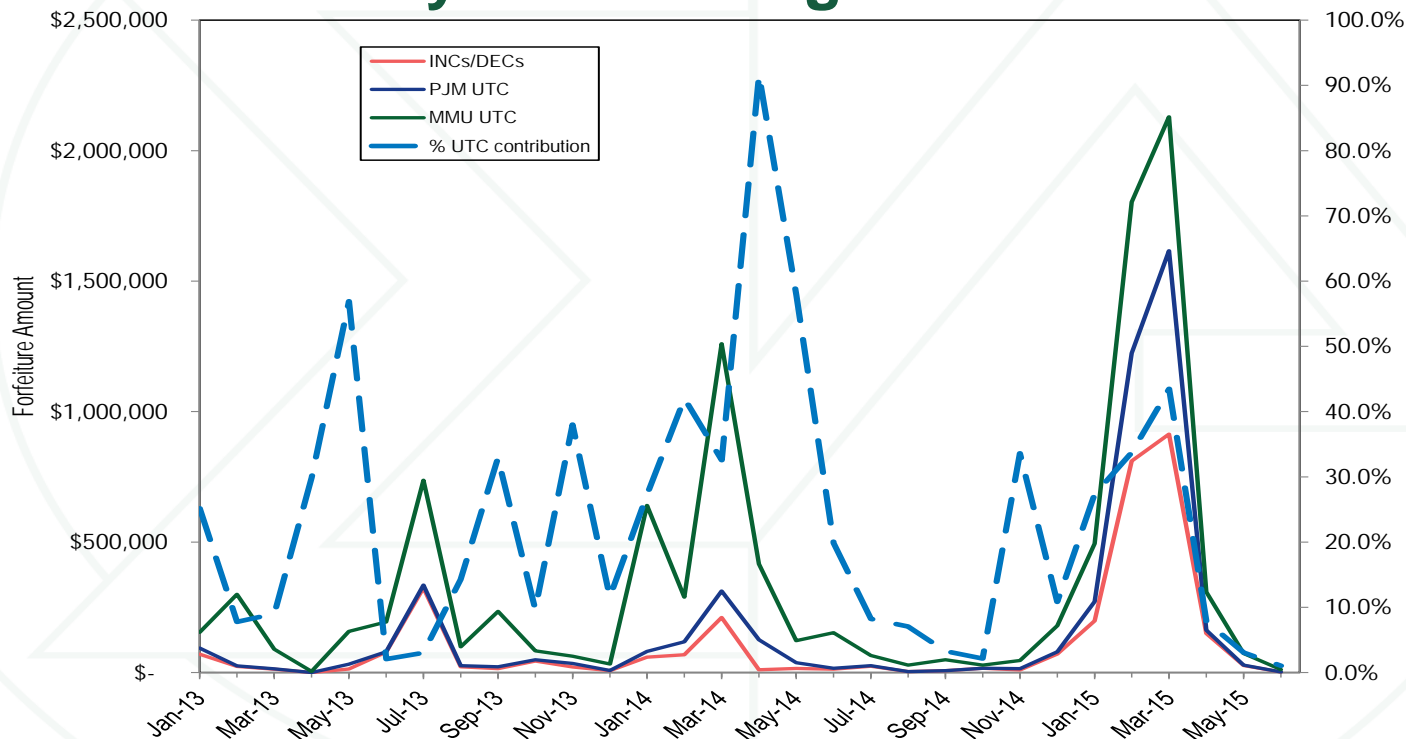


Table 13-4 Annual FTR Auction patterns of ownership by FTR direction: Planning period 2015 to 2016

Trade Type	Organization Type	Self-Scheduled FTRs	FTR Direction		All
			Prevailing Flow	Counter Flow	
Buy Bids	Physical	Yes	8.8%	0.9%	6.3%
		No	34.9%	24.1%	31.4%
		Total	43.7%	25.0%	37.7%
	Financial	No	56.3%	75.0%	62.3%
	Total		100.0%	100.0%	100.0%
Sell Offers	Physical		22.9%	23.5%	23.2%
	Financial		77.1%	76.5%	76.8%
	Total		100.0%	100.0%	100.0%

Table 13-37 ARR and FTR congestion offset (in millions): Planning periods 2013 to 2014 and 2014 to 2015

Planning Period	ARR Credits	FTR Credits	FTR Auction Revenue	Total ARR and FTR Offset	Congestion	Total Offset - Congestion Difference	Percent Offset
2013/2014	\$522.3	\$1,814.9	\$598.8	\$1,738.3	\$1,771.0	(\$32.7)	98.2%
2014/2015*	\$761.3	\$1,261.8	\$794.9	\$1,228.2	1,390.34	(\$162.1)	88.3%

* Shows twelve months through June 30, 2015

Table 13-14 FTR profits by organization type and FTR direction: 2015

Organization Type	Prevailing Flow	FTR Direction			
		Self Scheduled Prevailing Flow	Counter Flow	Self Scheduled Counter Flow	All
Physical	\$146,734,712	\$229,067,950	(\$36,477,115)	\$9,805	\$339,335,351
Financial	\$217,894,814	NA	(\$26,943,958)	NA	\$190,950,856
Total	\$364,629,526	\$229,067,950	(\$63,421,073)	\$9,805	\$530,286,207

Figure 3-26 PJM monthly cleared up-to congestion transactions by type (MW): January 2005 through June 2015

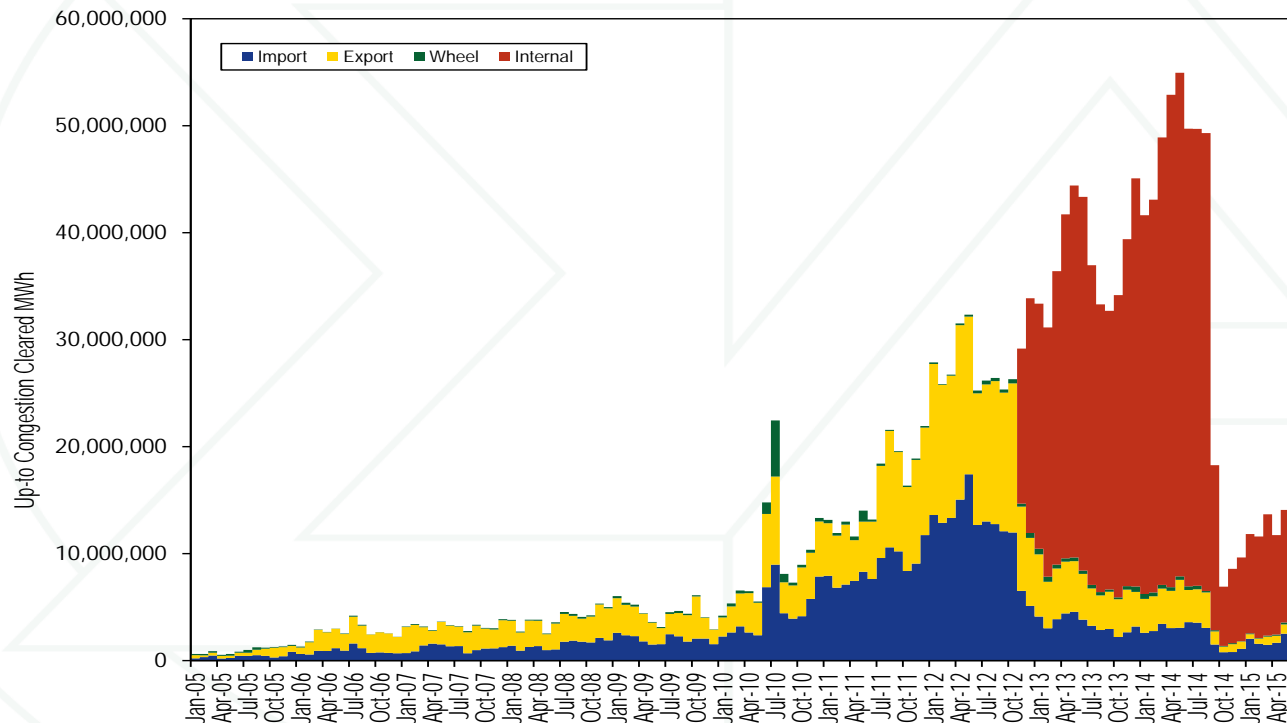


Table 3-37 PJM up-to congestion transactions by type of parent organization (MW): January through June 2014 and 2015

Category	2014 (Jan-Jun)		2015 (Jan-Jun)	
	Total Up-to Congestion MW	Percent	Total Up-to Congestion MW	Percent
Financial	276,055,889	94.8%	62,960,182	83.6%
Physical	15,264,864	5.2%	12,381,797	16.4%
Total	291,320,753	100.0%	75,341,979	100.0%

Table 12-24 Transmission facility outage request summary by planned duration: January through June of 2014 and 2015

Planned Duration (Days)	2014 (Jan - Jun)		2015 (Jan - Jun)	
	Outage Requests	Percent	Outage Requests	Percent
<=5	8,039	79.8%	8,279	78.5%
>5 & <=30	1,537	15.3%	1,705	16.2%
>30	493	4.9%	564	5.3%
Total	10,069	100.0%	10,548	100.0%

Table 12-25 PJM transmission facility outage request received status definition

Planned Duration (Days)	Ticket Submission Date	Received Status
<=5	Before the 1st of the month one month prior to the starting month of the outage	On Time
	After or on the 1st of the month one month prior to the starting month of the outage	Late
	After 8:00AM three days prior to the outage	Past Deadline
> 5 & <=30	Before the 1st of the month six months prior to the starting month of the outage	On Time
	After or on the 1st of the month six months prior to the starting month of the outage	Late
	After 8:00AM three days prior to the outage	Past Deadline
>30	The earlier of either February 1st or the 1st of the month six months prior to the starting month of the outage	On Time
	After or on the earlier of either February 1st or the 1st of the month six months prior to the starting month of the outage	Late
	After 8:00AM three days prior to the outage	Past Deadline

Table 12-26 Transmission facility outage request summary by received status: January through June of 2014 and 2015

Planned Duration (Days)	2014 (Jan - Jun)				2015 (Jan - Jun)			
	On Time	Late	Total	Percent Late	On Time	Late	Total	Percent Late
<=5	4,214	3,825	8,039	52.4%	4,545	3,734	8,279	54.9%
>5 & <=30	771	766	1,537	50.2%	846	859	1,705	49.6%
>30	172	321	493	34.9%	183	381	564	32.4%
Total	5,157	4,912	10,069	51.2%	5,574	4,974	10,548	52.8%

Table 12-27 Transmission facility outage request summary by emergency: January through June of 2014 and 2015

Planned Duration (Days)	2014 (Jan - Jun)				2015 (Jan - Jun)			
	Emergency	Non Emergency	Total	Percent Emergency	Emergency	Non Emergency	Total	Percent Emergency
<=5	1,238	6,801	8,039	15.4%	1,069	7,210	8,279	12.9%
>5 & <=30	200	1,337	1,537	13.0%	237	1,468	1,705	13.9%
>30	89	404	493	18.1%	63	501	564	11.2%
Total	1,527	8,542	10,069	15.2%	1,369	9,179	10,548	13.0%

Table 12-28 Transmission facility outage request summary by congestion: June of 2014 and 2015

Planned Duration (Days)	2014 (Jan - Jun)				2015 (Jan - Jun)			
	Congestion Expected	No Congestion Expected	Total	Percent Congestion Expected	Congestion Expected	No Congestion Expected	Total	Percent Congestion Expected
<=5	679	7,360	8,039	8.4%	766	7,513	8,279	9.3%
>5 & <=30	148	1,389	1,537	9.6%	188	1,517	1,705	11.0%
>30	44	449	493	8.9%	57	507	564	10.1%
Total	871	9,198	10,069	8.7%	1,011	9,537	10,548	9.6%

Table 12-29 Transmission facility outage requests that by received status, congestion and emergency: January through June of 2014 and 2015

		2014 (Jan - Jun)				2015 (Jan - Jun)			
Submission Status		Congestion Expected	No Congestion Expected	Total	Percent Congestion	Congestion Expected	No Congestion Expected	Total	Percent Congestion
Late	Emergency	44	1,475	1,519	2.9%	55	1,308	1,363	4.0%
	Non Emergency	167	3,226	3,393	4.9%	172	3,439	3,611	4.8%
On Time	Emergency	0	8	8	0.0%	0	6	6	0.0%
	Non Emergency	660	4,489	5,149	12.8%	784	4,784	5,568	14.1%
Total		871	9,198	10,069	8.7%	1,011	9,537	10,548	9.6%

Table 12-30 Transmission facility outage requests that might cause congestion status summary: January through June of 2014 and 2015

Submission Status		2014 (Jan - Jun)						2015 (Jan - Jun)					
		Cancelled	Complete	In Process	Denied	Congestion Expected	Percent Complete	Cancelled	Complete	In Process	Denied	Congestion Expected	Percent Complete
Late	Emergency	2	41	1	0	44	93.2%	7	47	0	1	55	85.5%
	Non Emergency	29	117	1	20	167	70.1%	38	108	2	24	172	62.8%
On Time	Non Emergency	133	485	1	41	660	73.5%	223	516	3	42	784	65.8%
	Total	164	643	3	61	871	73.8%	268	671	5	67	1,011	66.4%

Table 12-31 Rescheduled transmission outage request summary: January through June of 2014 and 2015

Days	2014 (Jan - Jun)					2015 (Jan - Jun)				
	Outage Requests	Approved and Revised	Percent Approved and Revised	Approved and Cancelled	Percent Approved and Cancelled	Outage Requests	Approved and Revised	Percent Approved and Revised	Approved and Cancelled	Percent Approved and Cancelled
<=5	8,039	270	3.4%	1,173	14.6%	8,279	207	2.5%	1,186	14.3%
>5 & <=30	1,537	68	4.4%	116	7.5%	1,705	54	3.2%	129	7.6%
>30	493	14	2.8%	30	6.1%	564	25	4.4%	50	8.9%
Total	10,069	352	3.5%	1,319	13.1%	10,548	286	2.7%	1,365	12.9%

Table 12-32 Transmission facility outage requests by received status: Planning period 2014 to 2015

Planned Duration	On Time	Late	Total	Percent Late
<2 weeks	9,300	8,346	17,646	47.3%
>=2 weeks & <2 months	805	821	1,626	50.5%
>=2 months	155	192	347	55.3%
Total	10,260	9,359	19,619	47.7%

Table 12-33 Transmission facility outage requests by received status and emergency: Planning period 2014 to 2015

Planned Duration	On Time			Late		
	Emergency	Non Emergency	Percent	Emergency	Non Emergency	Percent
<2 weeks	13	9,287	99.9%	2,363	5,983	71.7%
>=2 weeks & <2 months	0	805	100.0%	155	666	81.1%
>=2 months	0	155	100.0%	35	157	81.8%
Total	13	10,247	99.9%	2,553	6,806	72.7%

Table 12-34 Transmission facility outage requests by received status and congestion: Planning period 2014 to 2015

Planned Duration	On Time			Late		
	Congestion Expected	No Congestion Expected	Percent Congestion Expected	Congestion Expected	No Congestion Expected	Percent Congestion Expected
<2 weeks	1,334	7,966	14.3%	445	7,901	5.3%
>=2 weeks & <2 months	160	645	19.9%	43	778	5.2%
>=2 months	32	123	20.6%	6	186	3.1%
Total	1,526	8,734	14.9%	494	8,865	5.3%

Table 12-35 Transmission facility outage requests by received status and processed status: Planning period 2014 to 2015

Planned Duration	Processed Status	On Time	Percent	Late	Percent
<2 weeks	In Process	23	0.2%	166	2.0%
	Denied	106	1.1%	91	1.1%
	Cancelled by Company	2,766	29.7%	1,193	14.3%
	Completed	6,405	68.9%	6,895	82.6%
Total		9,300	100.0%	8,345	100.0%
≥2 weeks & <2 months	In Process	1	0.1%	9	1.1%
	Denied	0	0.0%	2	0.2%
	Cancelled by Company	194	24.1%	100	12.2%
	Completed	610	75.8%	710	86.5%
Total		805	100.0%	821	100.0%
≥2 months	In Process	0	0.0%	7	3.6%
	Denied	0	0.0%	0	0.0%
	Cancelled by Company	38	24.5%	19	9.9%
	Completed	117	75.5%	166	86.5%
Total		155	100.0%	192	100.0%

Table 12-36 Transmission facility outage requests by received status, processed status, emergency and congestion: Planning period 2014 to 2015

Planned Duration	Processed Status	On time					Late				
		Emerge		Non		Total	Emergency		Non		Total
		Congest	Yes	Congestion	Yes		Congestion	Yes	Congestion	Yes	
<2 weeks	In Progress	0	0	2	21	23	0	77	3	86	166
	Denied	0	0	72	34	106	1	8	39	43	91
	Cancelled by Company	1	1	362	2,402	2,766	9	133	75	977	1,194
	Completed	0	11	897	5,497	6,405	96	2,039	222	4,538	6,895
Total Submission		1	12	1,333	7,954	9,300	106	2,257	339	5,644	8,346
>=2 weeks & <2 months	In Progress	0	0	1	0	1	0	4	0	5	9
	Denied	0	0	0	0	0	0	0	2	0	2
	Cancelled by Company	0	0	30	164	194	0	5	5	90	100
	Completed	0	0	129	481	610	3	143	33	531	710
Total Submission		0	0	160	645	805	3	152	40	626	821
>=2 months	In Progress	0	0	0	0	0	0	1	0	6	7
	Denied	0	0	0	0	0	0	0	0	0	0
	Cancelled by Company	0	0	3	35	38	0	1	0	18	19
	Completed	0	0	29	88	117	0	33	6	127	166
Total Submission		0	0	32	123	155	0	35	6	151	192

Table 12-37 Transmission facility outage requests by submission status and bidding opening date: Planning period 2014 to 2015

Planned Duration	On Time			Late		
	Before Bidding Opening Date	After Bidding Opening Date	Percent After	Before Bidding Opening Date	After Bidding Opening Date	Percent After
<2 weeks	1,040	8,260	88.8%	78	8,267	99.1%
>=2 weeks & <2 months	475	330	41.0%	77	744	90.6%
>=2 months	127	28	18.1%	18	174	90.6%
Total	1,642	8,618	84.0%	173	9,185	98.2%

Table 12-38 Late transmission facility outage requests that are submitted after annual bidding opening date: Planning period 2014 to 2015

Planned Duration	Completed Outages	Total	Percent
<2 weeks	6,837	8,267	82.7%
>=2 weeks & <2 months	650	744	87.4%
>=2 months	150	174	86.2%
Total	7,637	9,185	83.1%

Table 12-39 Transmission facility outage request instance summary by congestion and emergency: Planning period 2014 to 2015

For Day-ahead Market	Submission Status	Congestion Expected	No Congestion Expected	Total	Percent Congestion
Late	Emergency	310	3,916	4,226	7.3%
	Non Emergency	2,677	15,682	18,359	14.6%
On Time	Emergency	816	11,101	11,917	6.8%
	Non Emergency	15,197	88,362	103,559	14.7%
Total		19,000	119,061	138,061	13.8%

Table 12-40 Transmission facility outage request instance status summary by congestion and emergency: Planning period 2014 to 2015

Processed Status	Late For Day-ahead Market					On Time For Day-ahead Market				
	Emergency Congestion Expected		Non Emergency Congestion Expected		Total	Emergency Congestion Expected		Non Emergency Congestion Expected		Total
	Yes	No	Yes	No		Yes	No	Yes	No	
Submitted	24	984	71	668	1,747	113	1,515	2,292	15,835	19,755
Cancelled by Company	8	41	86	703	838	8	132	593	4,273	5,006
Revised	14	131	48	265	458	215	3,649	2,678	13,927	20,469
Total	46	1,156	205	1,636	3,043	336	5,296	5,563	34,035	45,230
Other	264	2,760	2,472	14,046	19,542	480	5,805	9,634	54,327	70,246
Total	310	3,916	2,677	15,682	22,585	816	11,101	15,197	88,362	115,476

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