

Market Monitor Report

MC Webinar
August 19, 2019

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Monitoring Analytics

The energy market results were competitive

Market Element	Evaluation	Market Design
Market Structure: Aggregate Market	Partially Competitive	
Market Structure: Local Market	Not Competitive	
Participant Behavior	Competitive	
Market Performance	Competitive	Effective

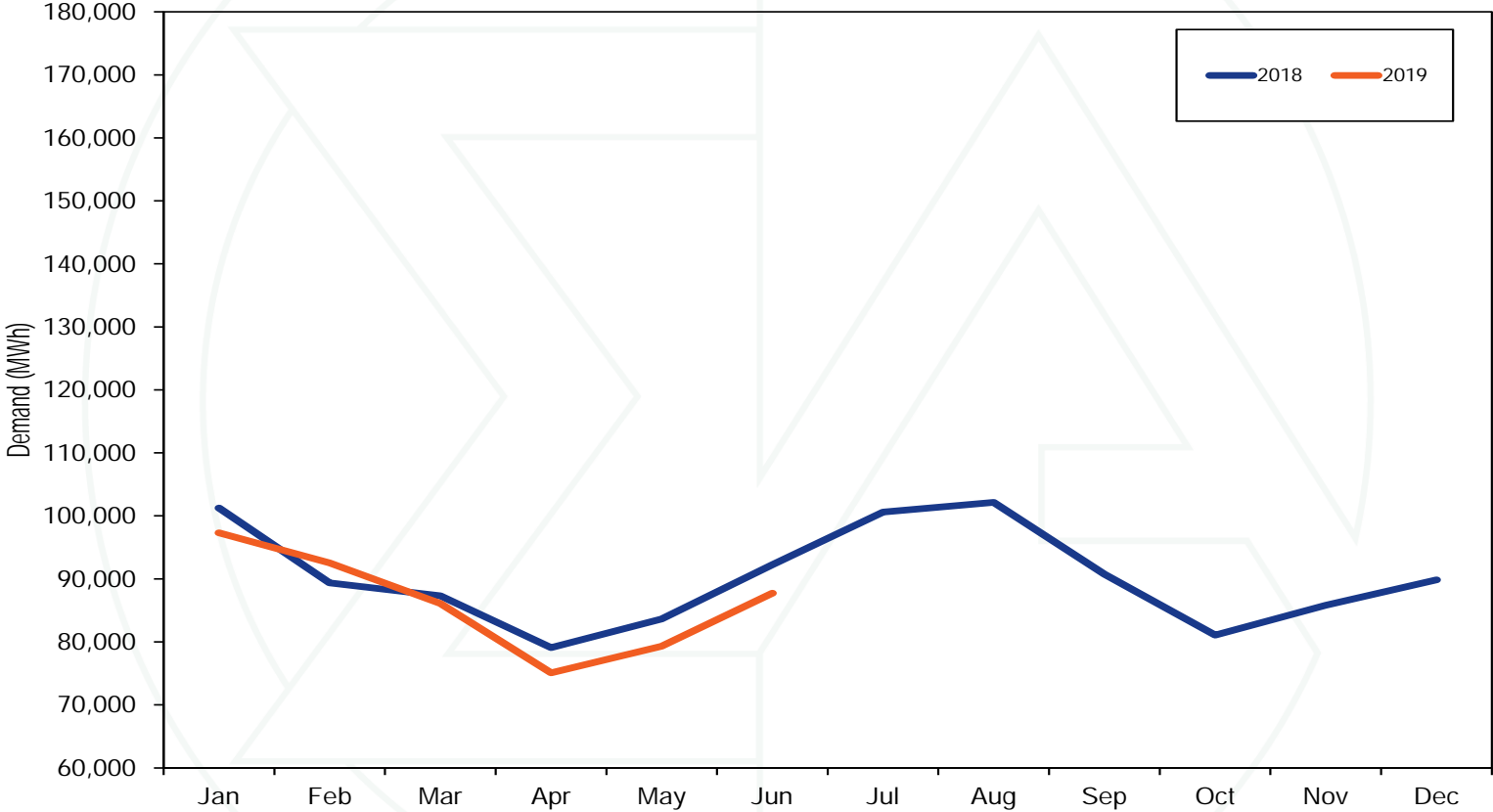
Total price per MWh by category

Category	Jan-Jun 2018 \$/MWh	Jan-Jun 2018 (\$ Millions)	Jan-Jun 2018 Percent of Total	Jan-Jun 2019 \$/MWh	Jan-Jun 2019 (\$ Millions)	Jan-Jun 2019 Percent of Total	Percent Change
Load Weighted Energy	\$27.48	\$10,603	64.5%	\$17.48	\$6,551	51.7%	(36.4%)
Capacity	\$7.85	\$3,028	18.4%	\$8.77	\$3,288	25.9%	11.8%
Capacity	\$7.82	\$3,016	18.3%	\$8.76	\$3,281	25.9%	12.0%
Capacity (FRR)	\$0.00	\$0	0.0%	\$0.00	\$0	0.0%	0.0%
Capacity (RMR)	\$0.03	\$12	0.1%	\$0.02	\$7	0.1%	(38.5%)
Transmission	\$6.17	\$2,379	14.5%	\$6.72	\$2,517	19.9%	8.9%
Transmission Service Charges	\$5.71	\$2,203	13.4%	\$6.30	\$2,361	18.6%	10.3%
Transmission Enhancement Cost Recovery	\$0.40	\$153	0.9%	\$0.36	\$135	1.1%	(8.9%)
Transmission Owner (Schedule 1A)	\$0.06	\$23	0.1%	\$0.06	\$21	0.2%	(6.6%)
Transmission Seams Elimination Cost Assignment (SECA)	\$0.00	\$0	0.0%	\$0.00	\$0	0.0%	0.0%
Transmission Facility Charges	\$0.00	\$0	0.0%	\$0.00	\$0	0.0%	0.0%
Ancillary	\$0.59	\$227	1.4%	\$0.45	\$170	1.3%	(22.8%)
Reactive	\$0.28	\$110	0.7%	\$0.30	\$111	0.9%	4.4%
Regulation	\$0.15	\$60	0.4%	\$0.07	\$25	0.2%	(56.6%)
Black Start	\$0.06	\$22	0.1%	\$0.05	\$20	0.2%	(2.7%)
Synchronized Reserves	\$0.05	\$19	0.1%	\$0.02	\$9	0.1%	(51.9%)
Non-Synchronized Reserves	\$0.02	\$7	0.0%	\$0.01	\$3	0.0%	(50.6%)
Day Ahead Scheduling Reserve (DASR)	\$0.03	\$10	0.1%	\$0.00	\$1	0.0%	(88.0%)
Administration	\$0.33	\$129	0.8%	\$0.33	\$122	1.0%	(2.9%)
PJM Administrative Fees	\$0.31	\$121	0.7%	\$0.30	\$113	0.9%	(3.4%)
NERC/RFC	\$0.02	\$7	0.0%	\$0.02	\$8	0.1%	5.7%
RTO Startup and Expansion	\$0.00	\$1	0.0%	\$0.00	\$1	0.0%	0.0%
Energy Uplift (Operating Reserves)	\$0.22	\$84	0.5%	\$0.06	\$23	0.2%	(71.5%)
Demand Response	\$0.00	\$1	0.0%	\$0.00	\$1	0.0%	(46.9%)
Load Response	\$0.00	\$1	0.0%	\$0.00	\$1	0.0%	(46.9%)
Emergency Load Response	\$0.00	\$0	0.0%	\$0.00	\$0	0.0%	0.0%
Emergency Energy	\$0.00	\$0	0.0%	\$0.00	\$0	0.0%	0.0%
Total Price	\$42.63	\$16,451	100.0%	\$33.81	\$12,673	100.0%	(20.7%)
Total Load (GWh)	385,864			374,789			(2.9%)
Total Billing (\$ Billions)	\$16.45			\$12.67			(23.0%)

PJM load

Jan-Jun	PJM Real-Time Demand (MWh)				Year-to-Year Change			
	Load		Load Plus Exports		Load		Load Plus Exports	
	Load	Standard Deviation	Demand	Standard Deviation	Load	Standard Deviation	Demand	Standard Deviation
2001	30,180	5,274	32,041	5,103	NA	NA	NA	NA
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%
2016	85,800	14,517	89,746	14,798	(5.3%)	(10.3%)	(5.3%)	(10.8%)
2017	84,569	13,670	89,477	13,638	(1.4%)	(5.8%)	(0.3%)	(7.8%)
2018	88,847	14,683	92,352	14,818	5.1%	7.4%	3.2%	8.7%
2019	86,297	14,038	91,262	14,303	(2.9%)	(4.4%)	(1.2%)	(3.5%)

RT monthly average hourly load



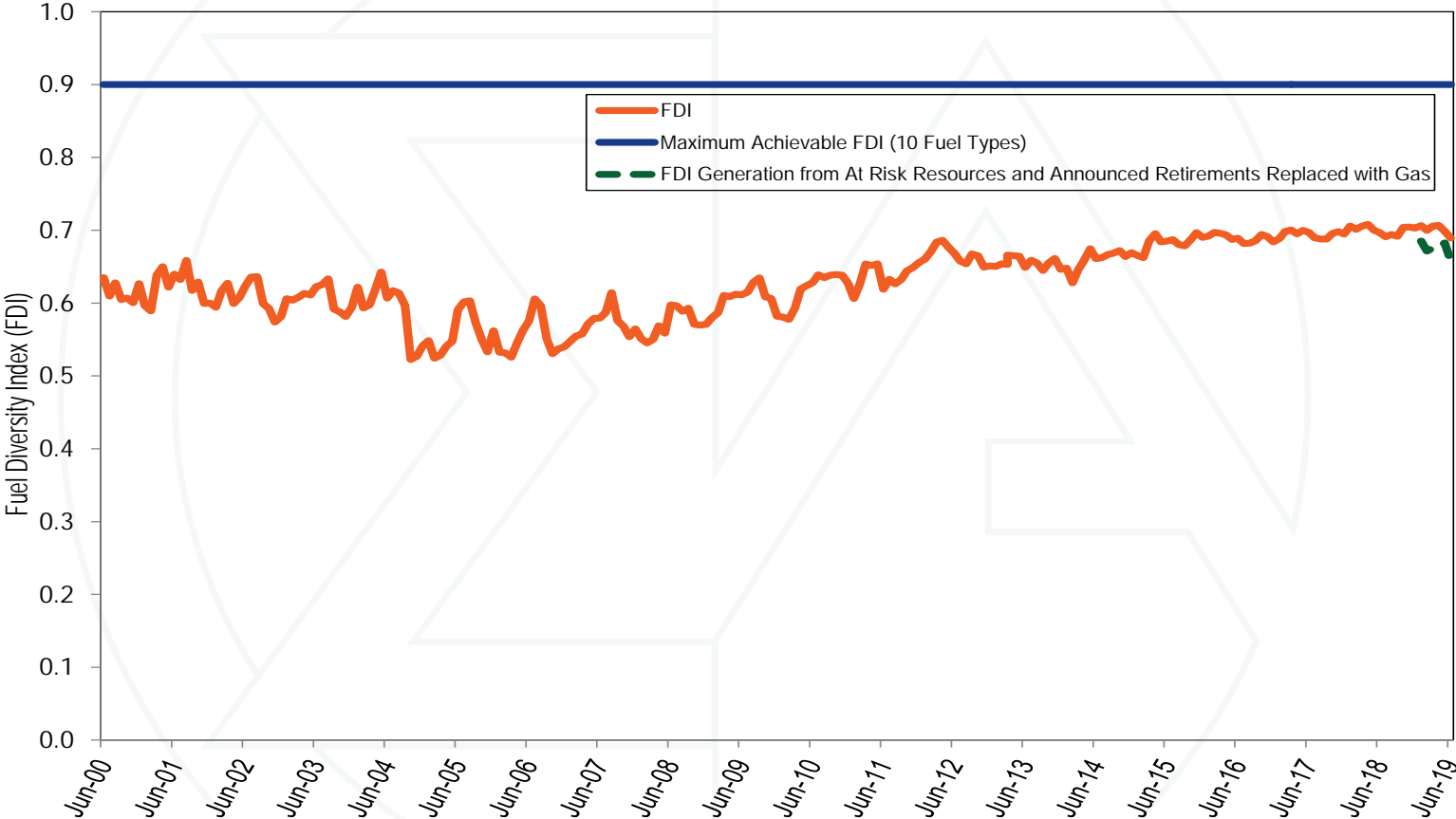
Generation by fuel source

		2018 (Jan - Jun)		2019 (Jan - Jun)		Change in Output
		GWh	Percent	GWh	Percent	
Coal		119,918.8	29.7%	99,864.2	24.8%	(16.7%)
	Bituminous	100,884.4	25.0%	84,501.8	21.0%	(16.2%)
	Sub Bituminous	15,006.8	3.7%	11,708.4	2.9%	(22.0%)
	Other Coal	4,027.6	1.0%	3,654.1	0.9%	(9.3%)
Nuclear		141,179.9	35.0%	138,609.7	34.4%	(1.8%)
Gas		115,143.0	28.5%	136,016.0	33.8%	18.1%
	Natural Gas	113,983.3	28.2%	134,943.6	33.5%	18.4%
	Landfill Gas	1,159.4	0.3%	1,072.2	0.3%	(7.5%)
	Other Gas	0.3	0.0%	0.2	0.0%	(35.7%)
Hydroelectric		8,797.9	2.2%	9,817.5	2.4%	11.6%
	Pumped Storage	2,582.9	0.6%	2,188.8	0.5%	(15.3%)
	Run of River	5,364.5	1.3%	7,002.2	1.7%	30.5%
	Other Hydro	850.5	0.2%	626.6	0.2%	(26.3%)
Wind		12,081.6	3.0%	13,644.9	3.4%	12.9%
Waste		2,208.6	0.5%	2,125.6	0.5%	(3.8%)
	Solid Waste	2,072.2	0.5%	2,052.7	0.5%	(0.9%)
	Miscellaneous	136.4	0.0%	73.0	0.0%	(46.5%)
Oil		2,529.6	0.6%	907.5	0.2%	(64.1%)
	Heavy Oil	428.0	0.1%	6.5	0.0%	(98.5%)
	Light Oil	825.5	0.2%	88.1	0.0%	(89.3%)
	Diesel	350.4	0.1%	65.1	0.0%	(81.4%)
	Gasoline	0.0	0.0%	0.0	0.0%	NA
	Kerosene	56.6	0.0%	9.9	0.0%	(82.5%)
	Jet Oil	8.0	0.0%	0.0	0.0%	(100.0%)
	Other Oil	861.1	0.2%	738.0	0.2%	(14.3%)
Solar, Net Energy Metering		1,076.2	0.3%	1,349.6	0.3%	25.4%
Battery		7.5	0.0%	10.9	0.0%	45.9%
Biofuel		876.8	0.2%	592.1	0.1%	(32.5%)
Total		403,819.9	100.0%	402,938.1	100.0%	(0.2%)

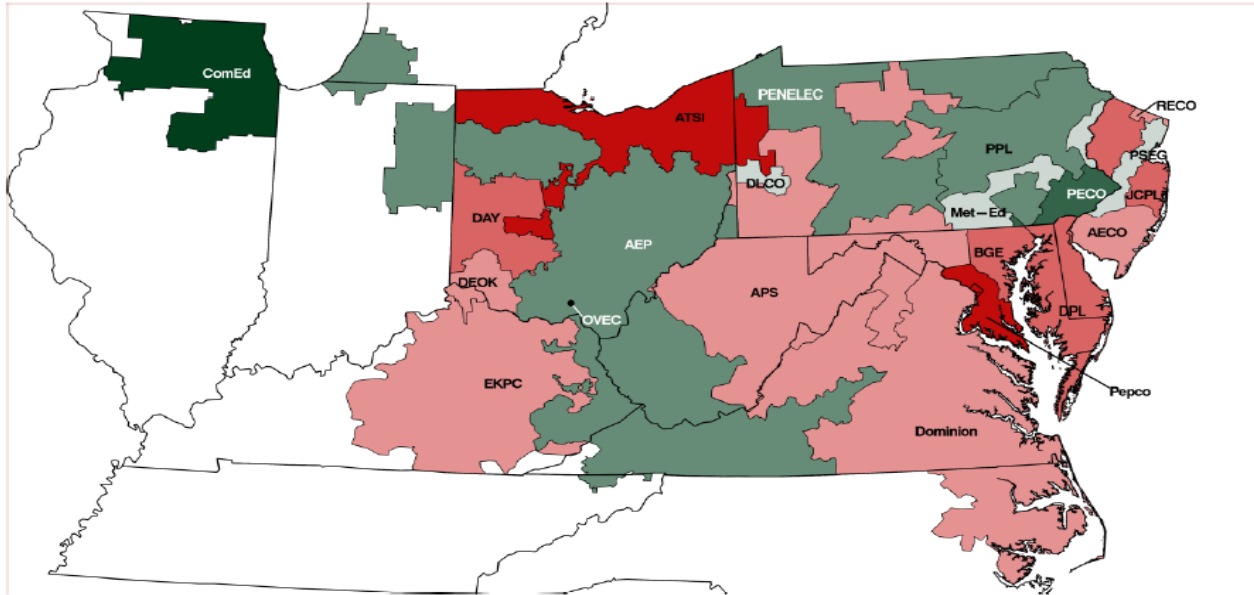
Capacity factor by unit type

Unit Type	2018 (Jan-Jun)		2019 (Jan-Jun)		Change in 2019 from 2018
	Generation (GWh)	Capacity Factor	Generation (GWh)	Capacity Factor	
Battery	7.5	0.6%	10.9	0.7%	0.1%
Combined Cycle	104,629.3	58.6%	129,454.2	60.9%	2.2%
Single Fuel	86,298.5	62.7%	111,257.0	66.8%	4.1%
Dual Fuel	18,330.8	44.9%	18,197.2	39.5%	(5.4%)
Combustion Turbine	7,786.5	6.2%	4,394.0	3.5%	(2.7%)
Single Fuel	4,816.0	5.2%	2,993.6	3.3%	(1.9%)
Dual Fuel	2,970.5	9.0%	1,400.4	4.1%	(4.9%)
Diesel	178.3	11.5%	108.3	6.8%	(4.7%)
Single Fuel	170.7	12.5%	106.6	7.6%	(4.9%)
Dual Fuel	7.6	4.2%	1.8	1.0%	(3.2%)
Diesel (Landfill gas)	900.7	52.8%	826.3	49.1%	(3.7%)
Fuel Cell	112.2	85.1%	109.3	81.7%	(3.4%)
Nuclear	141,179.9	93.2%	138,609.7	93.1%	(0.1%)
Pumped Storage Hydro	3,236.8	14.7%	2,589.9	11.8%	(2.9%)
Run of River Hydro	5,561.1	43.1%	7,227.6	55.3%	12.2%
Solar	1,073.7	18.8%	1,323.2	19.3%	0.5%
Steam	127,069.6	39.9%	104,613.3	35.2%	(4.7%)
Biomass	3,249.3	62.1%	2,873.8	59.7%	(2.5%)
Coal	120,529.1	45.7%	99,905.2	40.4%	(5.3%)
Single Fuel	117,046.1	47.0%	98,560.0	42.3%	(4.6%)
Dual Fuel	3,483.1	23.9%	1,345.2	9.2%	(14.7%)
Natural Gas	2,933.3	35.2%	1,830.8	38.1%	2.8%
Single Fuel	286.4	41.7%	194.3	47.0%	5.3%
Dual Fuel	2,647.0	22.1%	1,636.5	18.8%	(3.3%)
Oil	357.8	2.3%	3.5	0.0%	(2.3%)
Wind	12,081.6	32.8%	13,644.9	34.0%	1.2%
Total	403,819.5	47.2%	402,914.0	46.3%	(0.9%)

Fuel diversity index for energy



RT generation less RT load

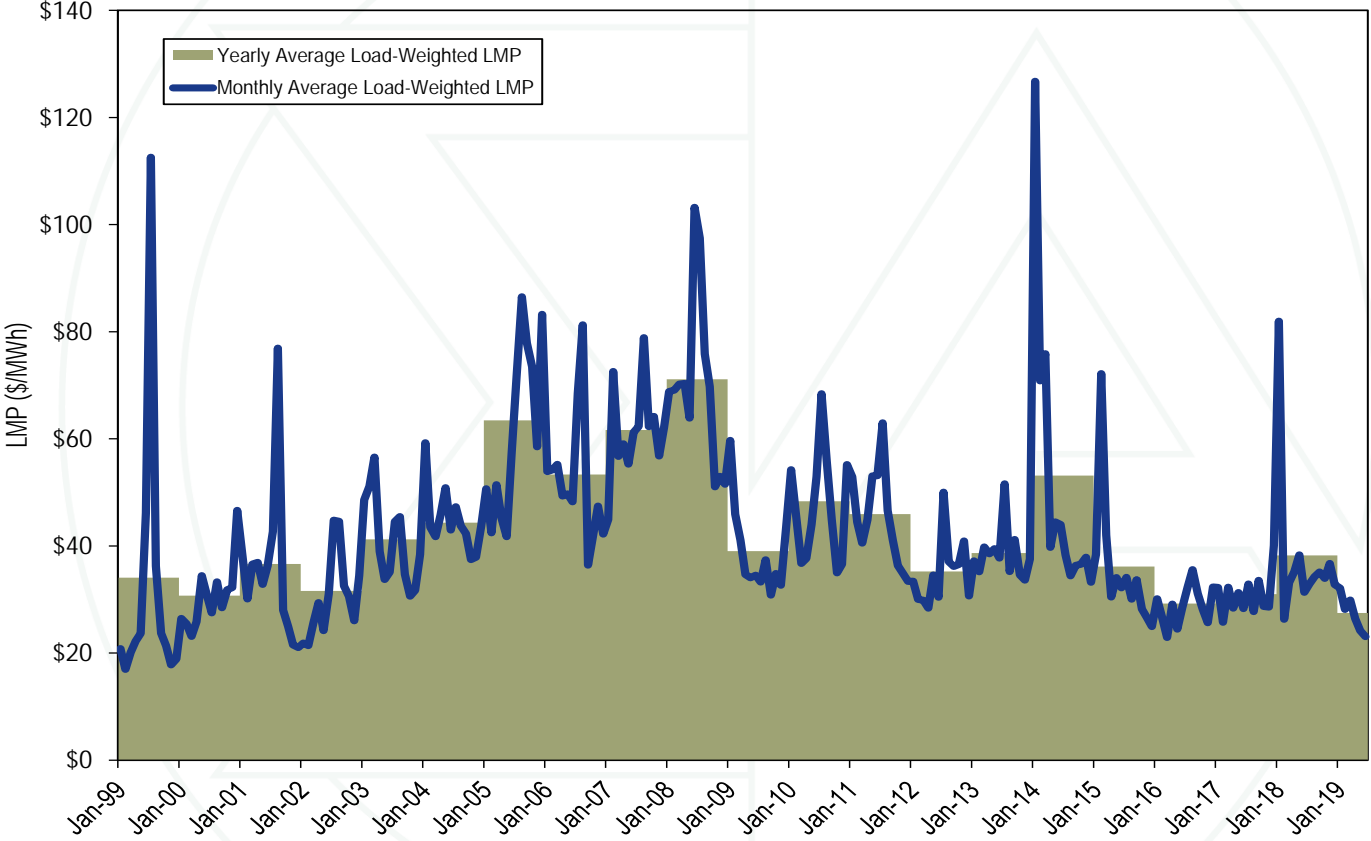


Zone	Net Gen Minus Load (GWh)	Zone	Net Gen Minus Load (GWh)	Zone	Net Gen Minus Load (GWh)	Zone	Net Gen Minus Load (GWh)
AECO	(1,743)	DAY	(8,001)	JCP&L	(5,037)	PPL	10,351
AEP	11,433	DEOK	(2,983)	Met-Ed	3,592	PSEG	1,115
APS	(724)	Dominion	(1,576)	OVEC	5,171	RECO	(663)
ATSI	(12,793)	DPL	(6,601)	PECO	14,997		
BGE	(6,488)	DLCO	1,936	PENELEC	12,211		
ComEd	21,291	EKPC	(3,344)	Pepco	(9,059)		

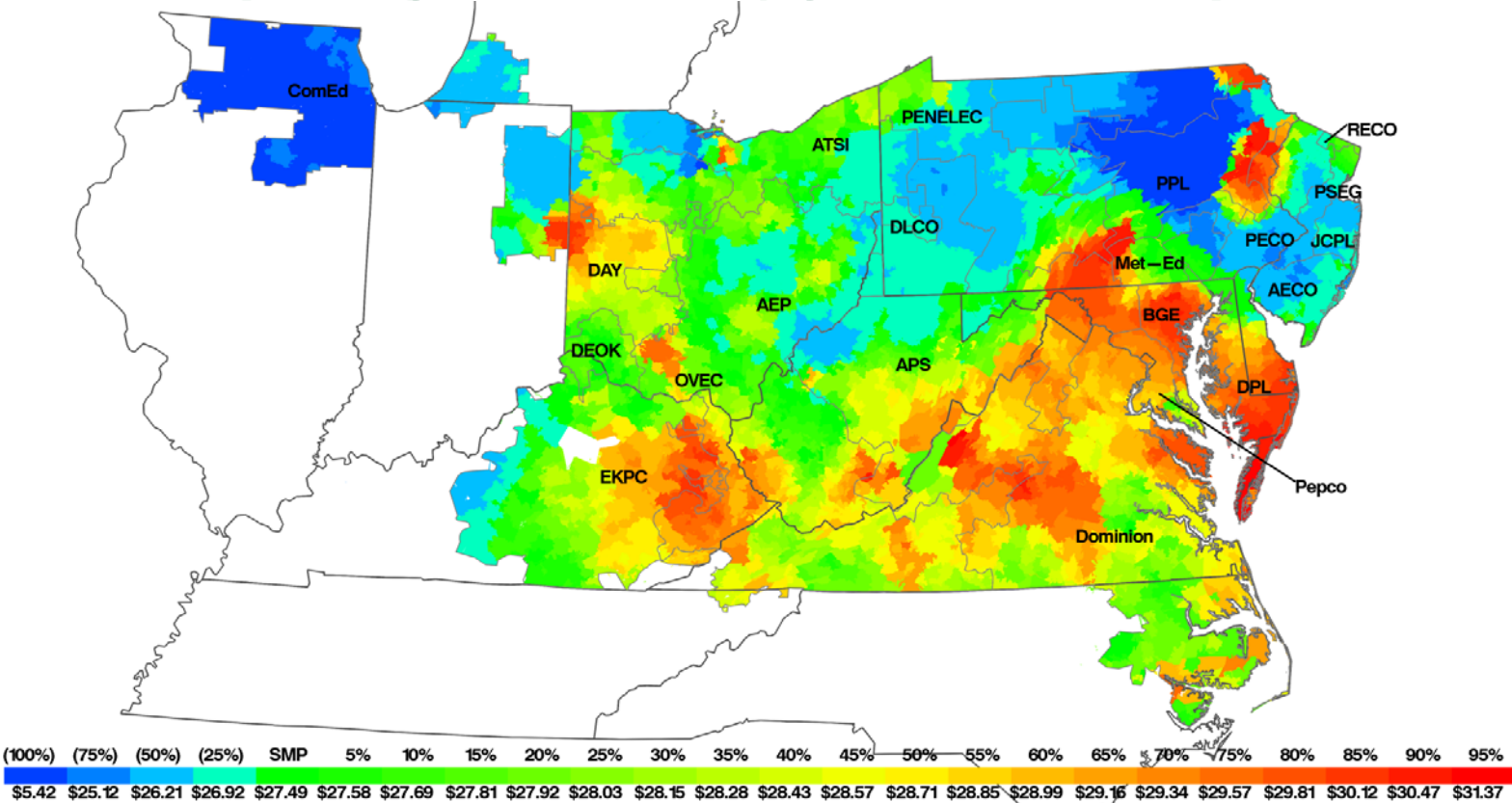
RT, load-weighted, average LMP

(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%)
2016	\$27.09	\$23.82	\$14.49	(36.0%)	(21.5%)	(61.7%)
2017	\$29.81	\$26.47	\$12.88	10.1%	11.1%	(11.1%)
2018	\$42.44	\$28.36	\$43.68	42.4%	7.1%	239.1%
2019	\$27.49	\$24.40	\$16.38	(35.2%)	(14.0%)	(62.5%)

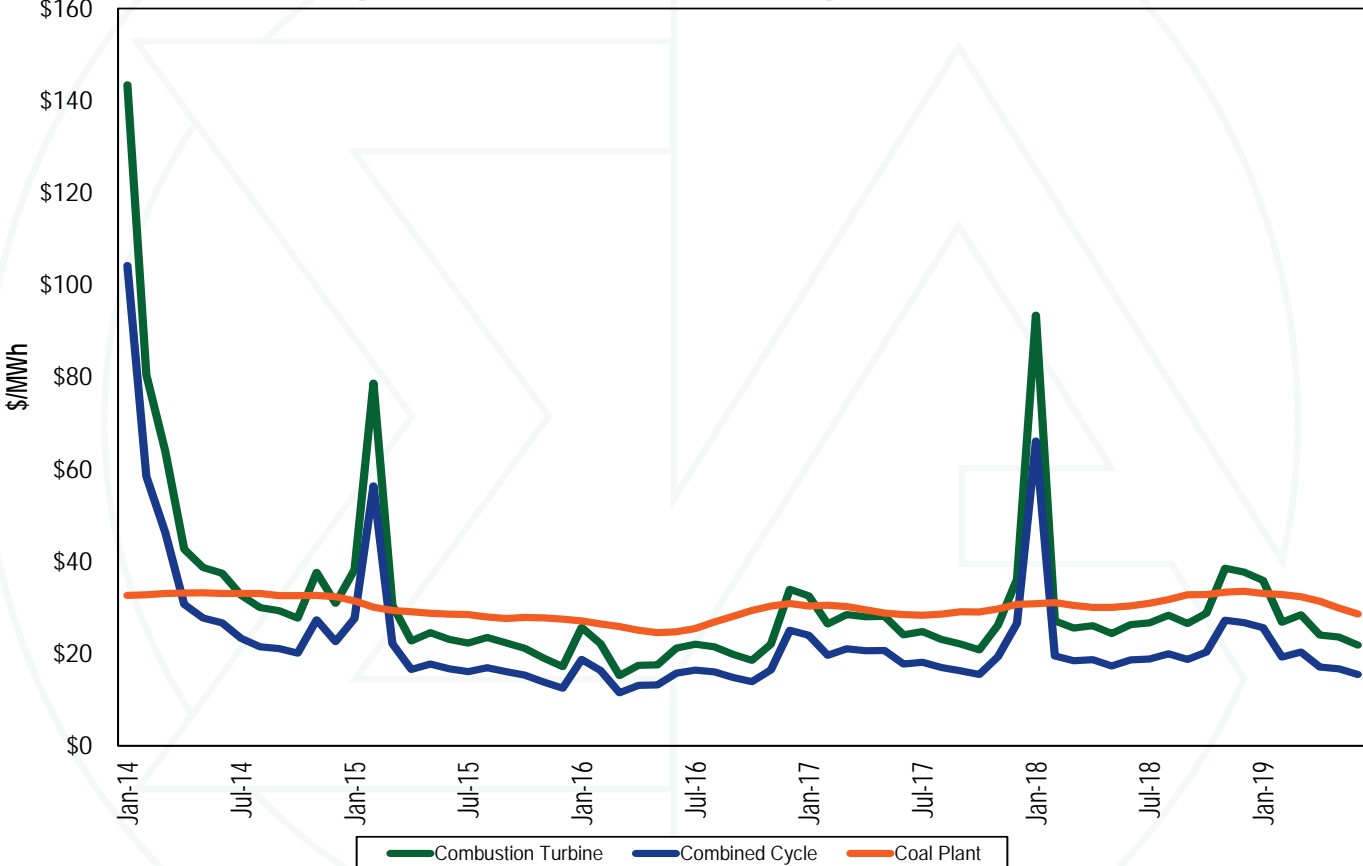
RT, load-weighted, average LMP



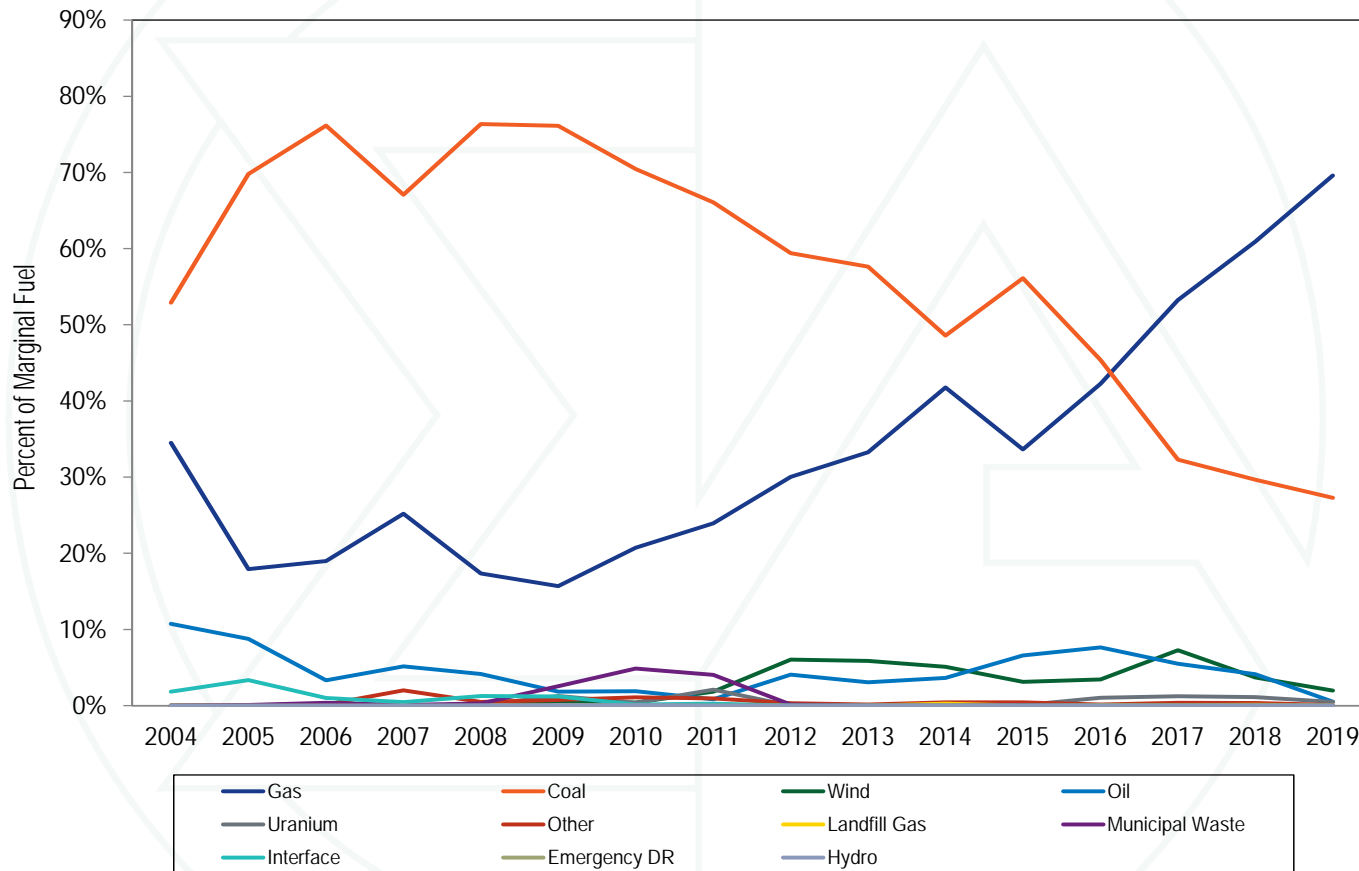
RT, load-weighted, average LMP



Short run marginal costs of generation



Type of fuel used by RT marginal units



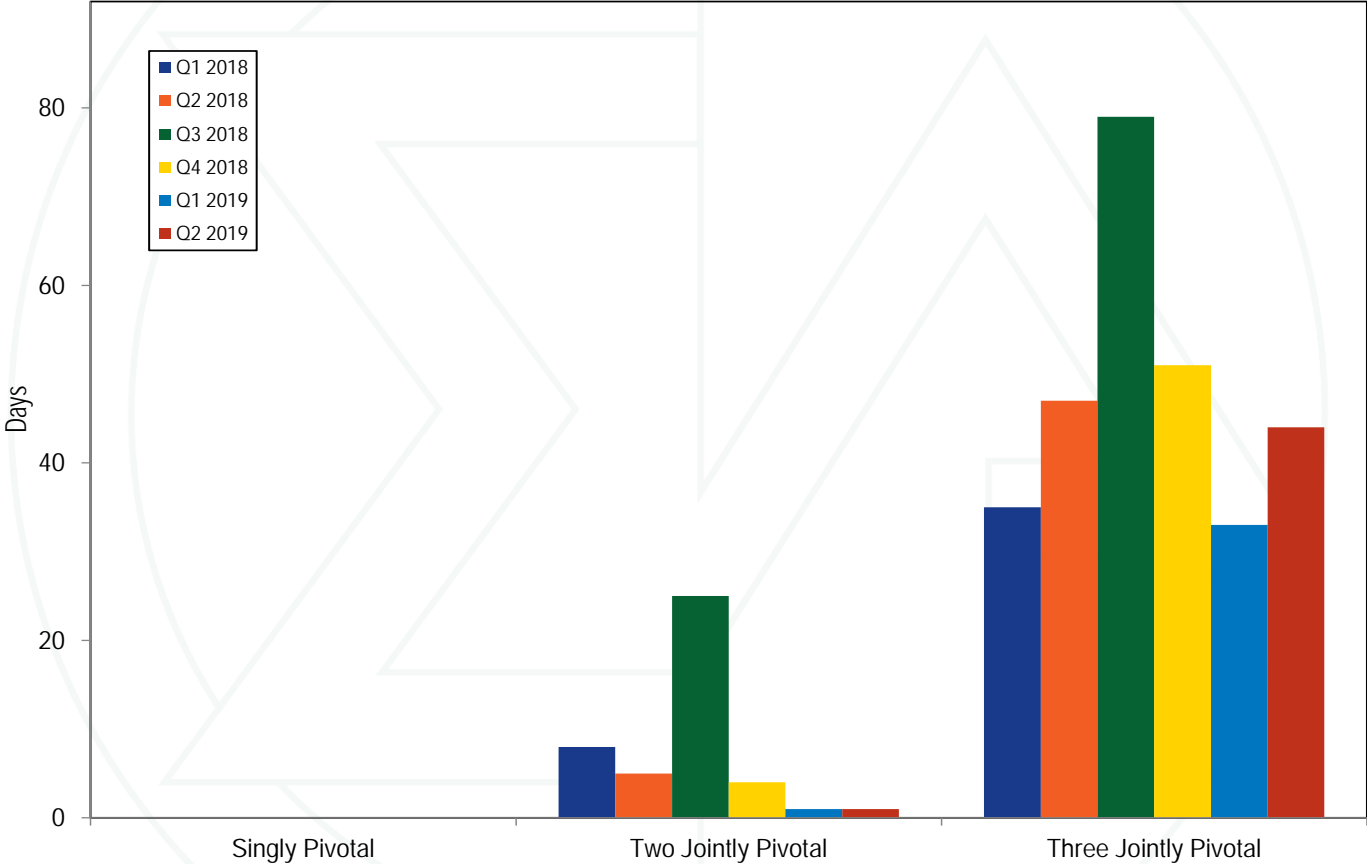
RT, fuel-cost adjusted, average LMP

	2019 Fuel-Cost Adjusted, Load-Weighted LMP	2019 Load-Weighted LMP	Change	Percent Change
Average	\$31.98	\$27.49	(\$4.49)	(14.1%)
	2018 Load-Weighted LMP	2019 Fuel-Cost Adjusted, Load-Weighted LMP	Change	Percent Change
Average	\$42.44	\$31.98	(\$10.46)	(24.6%)
	2018 Load-Weighted LMP	2019 Load-Weighted LMP	Change	Change
Average	\$42.44	\$27.49	(\$14.95)	(35.2%)

Components of RT (Unadjusted) LMP

Element	2018 (Jan - Jun)		2019 (Jan - Jun)		Change
	Contribution to LMP	Percent	Contribution to LMP	Percent	Percent
Gas	\$16.24	38.3%	\$12.46	45.3%	7.1%
Coal	\$7.82	18.4%	\$7.30	26.6%	8.1%
Ten Percent Adder	\$2.95	6.9%	\$2.16	7.8%	0.9%
Markup	\$5.05	11.9%	\$1.90	6.9%	(5.0%)
VOM	\$1.42	3.3%	\$1.54	5.6%	2.2%
Increase Generation Adder	\$1.06	2.5%	\$1.12	4.1%	1.6%
Scarcity Adder	\$0.00	0.0%	\$0.25	0.9%	0.9%
Ancillary Service Redispatch Cost	\$0.60	1.4%	\$0.24	0.9%	(0.5%)
CO ₂ Cost	\$0.04	0.1%	\$0.21	0.8%	0.7%
LPA Rounding Difference	\$0.70	1.7%	\$0.19	0.7%	(1.0%)
NA	\$2.95	6.9%	\$0.10	0.4%	(6.6%)
Opportunity Cost Adder	\$0.00	0.0%	\$0.04	0.1%	0.1%
Oil	\$3.40	8.0%	\$0.02	0.1%	(7.9%)
NO _x Cost	\$0.14	0.3%	\$0.01	0.0%	(0.3%)
Other	\$0.09	0.2%	\$0.00	0.0%	(0.2%)
Constraint Violation Adder	\$0.00	0.0%	\$0.00	0.0%	0.0%
Market-to-Market Adder	\$0.01	0.0%	\$0.00	0.0%	(0.0%)
Landfill Gas	\$0.00	0.0%	\$0.00	0.0%	0.0%
SO ₂ Cost	\$0.01	0.0%	\$0.00	0.0%	(0.0%)
Uranium	\$0.00	0.0%	\$0.00	0.0%	0.0%
Municipal Waste	\$0.20	0.5%	\$0.00	0.0%	(0.5%)
Wind	(\$0.01)	(0.0%)	\$0.00	0.0%	0.0%
LPA-SCED Differential	(\$0.02)	(0.1%)	(\$0.01)	(0.0%)	0.0%
Renewable Energy Credits	\$0.00	0.0%	(\$0.02)	(0.1%)	(0.1%)
Decrease Generation Adder	(\$0.20)	(0.5%)	(\$0.03)	(0.1%)	0.4%
Total	\$42.44	100.0%	\$27.49	100.0%	0.0%

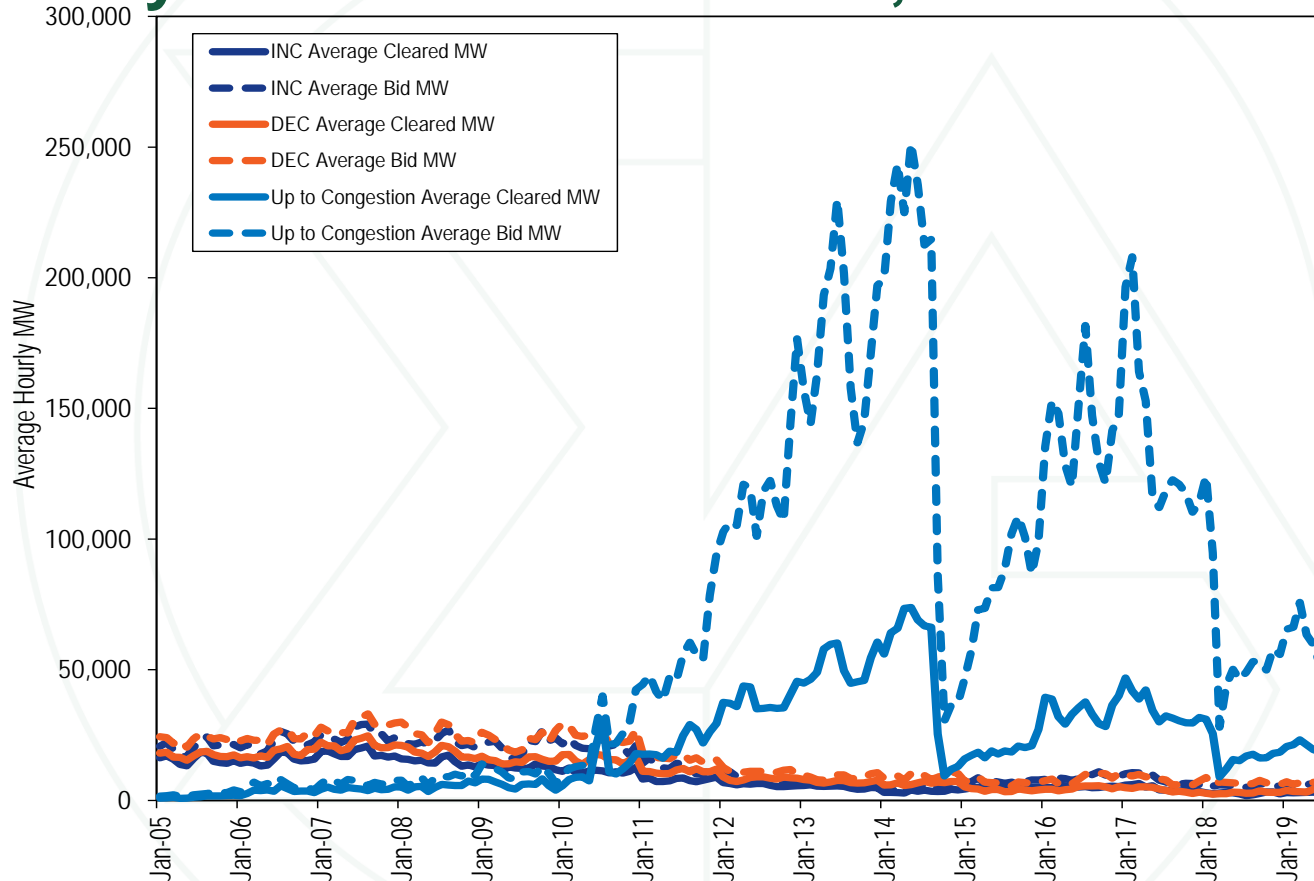
DA Energy Market: Days with pivotal suppliers



Offer capping statistics – energy only

(Jan-Jun)	Real-Time		Day-Ahead	
	Unit Hours Capped	MWh Capped	Unit Hours Capped	MWh Capped
2015	0.6%	0.4%	0.3%	0.2%
2016	0.3%	0.2%	0.1%	0.1%
2017	0.2%	0.1%	0.0%	0.0%
2018	1.3%	0.5%	0.1%	0.1%
2019	0.8%	0.7%	0.5%	0.4%

Monthly bid and cleared INCs, DECs and UTCs



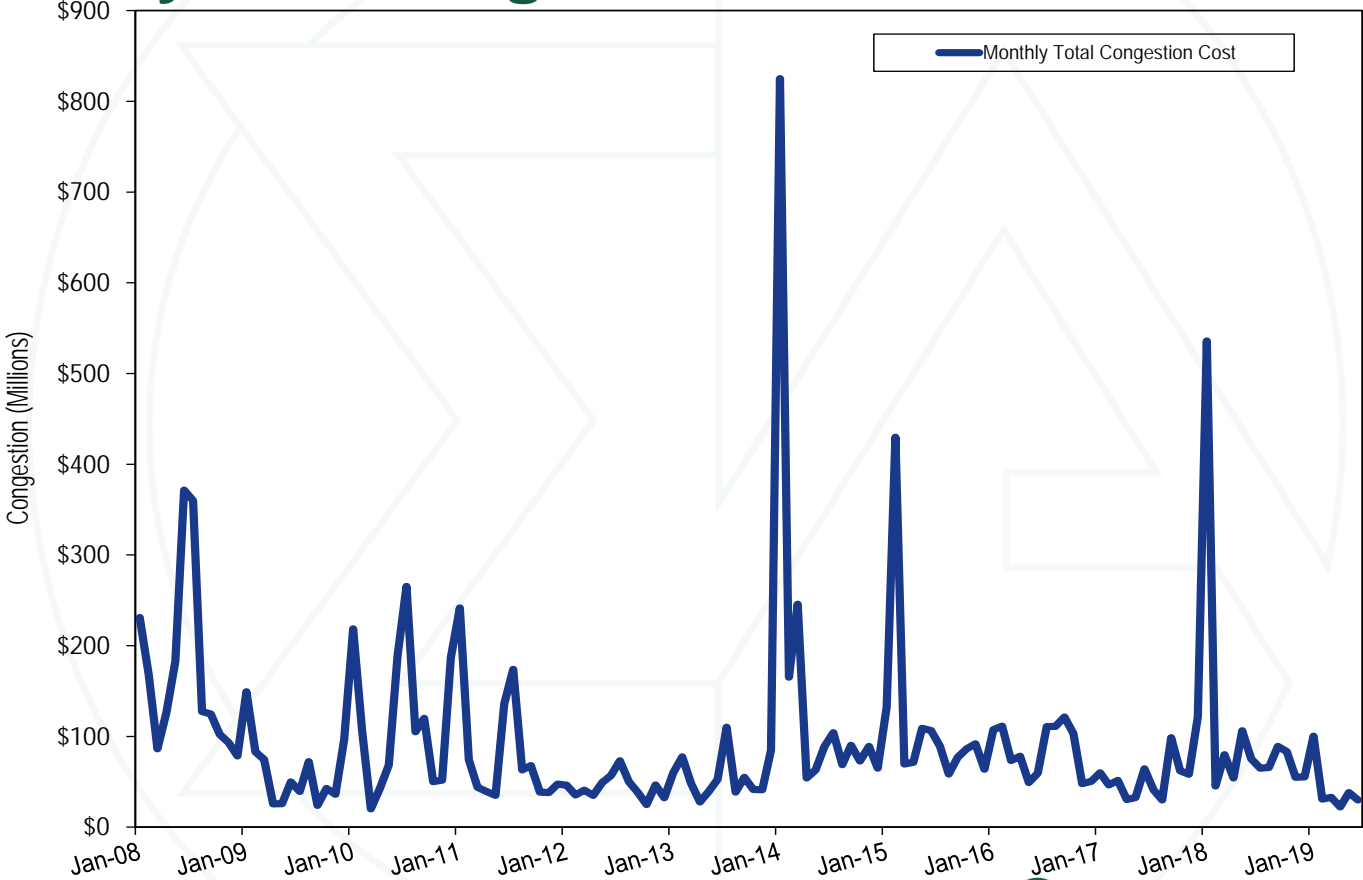
UTC transactions by type of parent

Category	2018 (Jan-Jun)				2019 (Jan-Jun)			
	Total Up to Congestion Bid MWh	Percent	Total Up to Congestion Cleared MWh	Percent	Total Up to Congestion Bid MWh	Percent	Total Up to Congestion Cleared MWh	Percent
Financial	275,239,147	98.6%	75,621,806	96.8%	272,585,372	98.5%	86,650,465	96.2%
Physical	3,772,044	1.4%	2,489,289	3.2%	4,227,216	1.5%	3,458,038	3.8%
Total	279,011,191	100.0%	78,111,095	100.0%	276,812,587	100.0%	90,108,504	100.0%

Total congestion

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%)	\$23,390	3.9%
2016	\$479	(47.8%)	\$18,290	2.6%
2017	\$286	(40.4%)	\$18,960	1.5%
2018	\$897	214.0%	\$25,780	3.5%
2019	\$254	(71.7%)	\$20,070	1.3%

Monthly total congestion cost



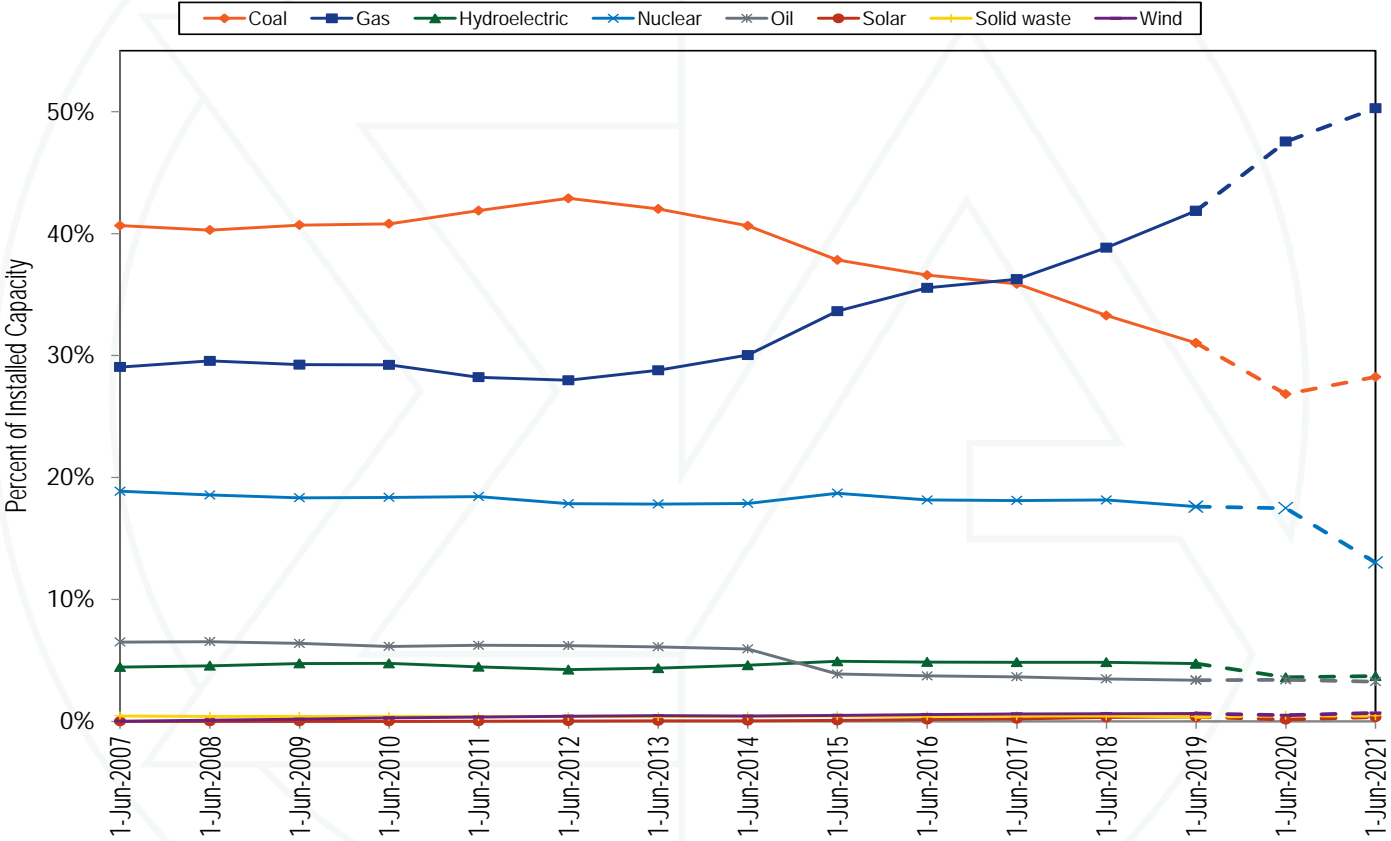
The capacity market results were not competitive: 2021/2022 BRA

Market Element	Evaluation	Market Design
Market Structure: Aggregate Market	Not Competitive	
Market Structure: Local Market	Not Competitive	
Participant Behavior	Not Competitive	
Market Performance	Not Competitive	Mixed

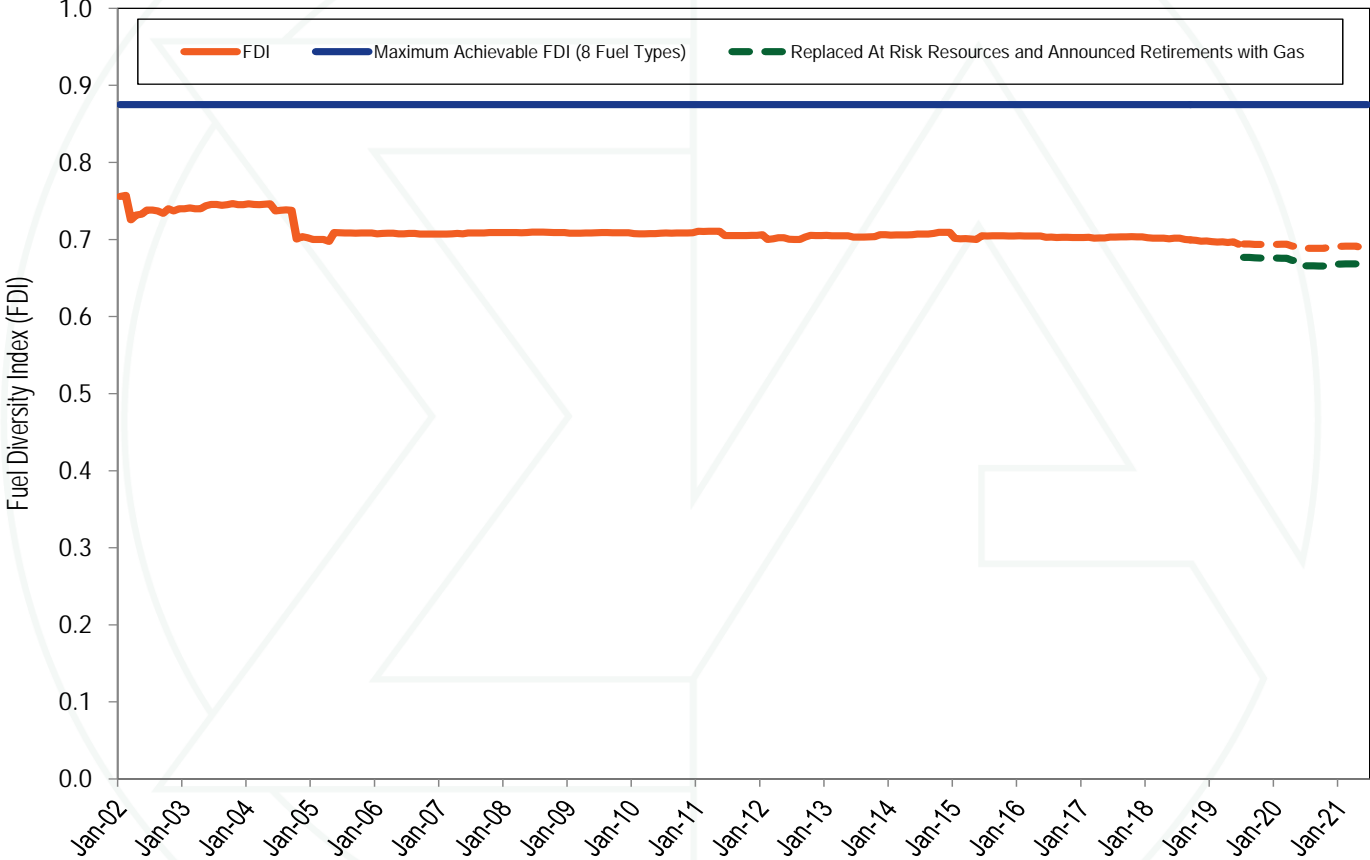
Installed capacity by fuel source

	01-Jan-19		31-May-19		01-Jun-19		30-Jun-19	
	MW	Percent	MW	Percent	MW	Percent	MW	Percent
Coal	60,763.4	32.6%	58,949.1	31.8%	58,159.4	31.0%	58,084.6	31.0%
Gas	75,261.2	40.4%	75,770.8	40.8%	78,475.8	41.9%	78,476.4	41.9%
Hydroelectric	8,888.2	4.8%	8,873.9	4.8%	8,873.9	4.7%	8,873.9	4.7%
Nuclear	32,684.5	17.5%	33,000.7	17.8%	33,001.7	17.6%	33,100.7	17.7%
Oil	6,388.2	3.4%	6,342.2	3.4%	6,330.2	3.4%	6,331.6	3.4%
Solar	640.0	0.3%	686.2	0.4%	702.6	0.4%	702.6	0.4%
Solid waste	712.3	0.4%	712.3	0.4%	702.3	0.4%	695.6	0.4%
Wind	1,158.3	0.6%	1,158.3	0.6%	1,192.2	0.6%	1,192.2	0.6%
Total	186,496.1	100.0%	185,493.5	100.0%	187,438.1	100.0%	187,457.6	100.0%

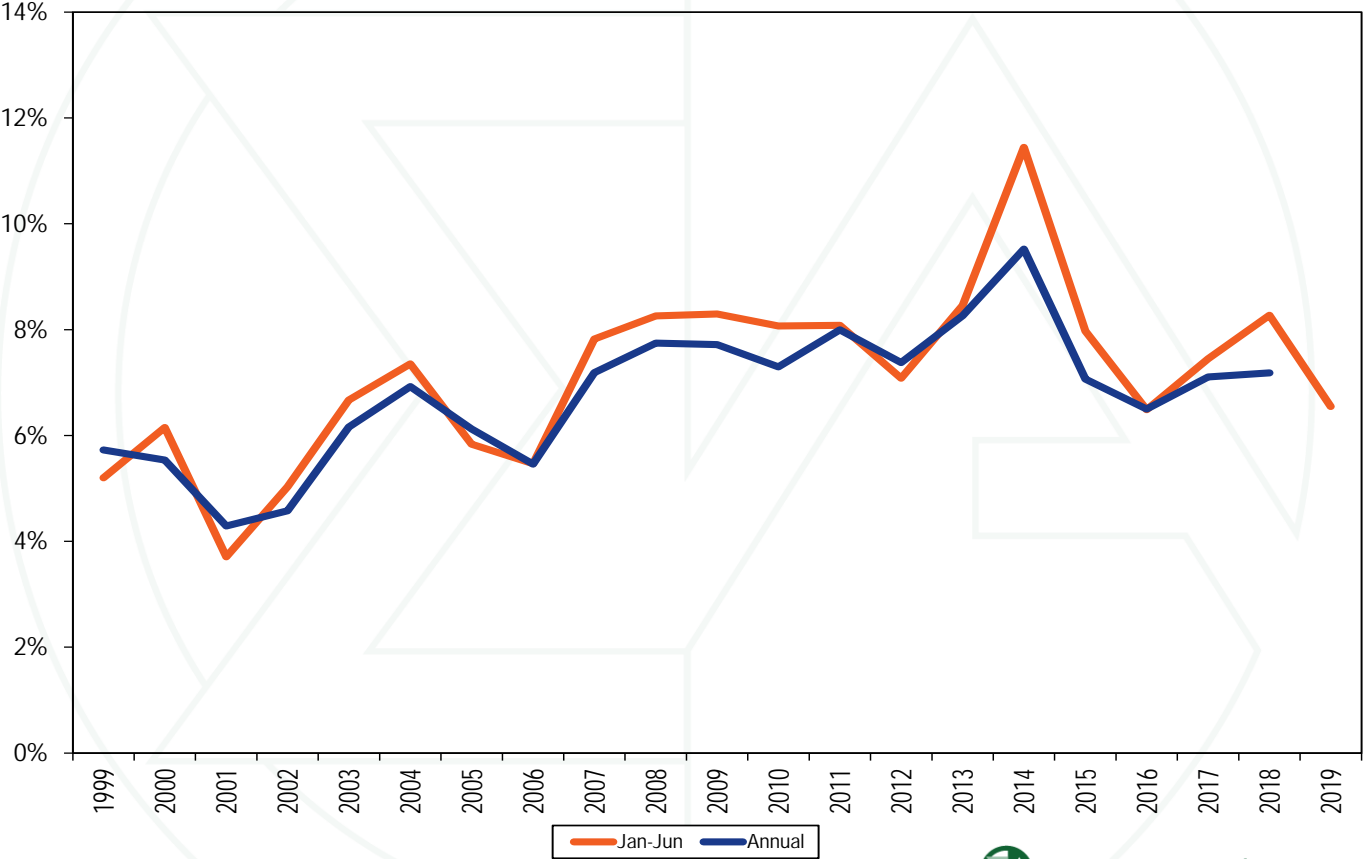
Percent of installed capacity by fuel source



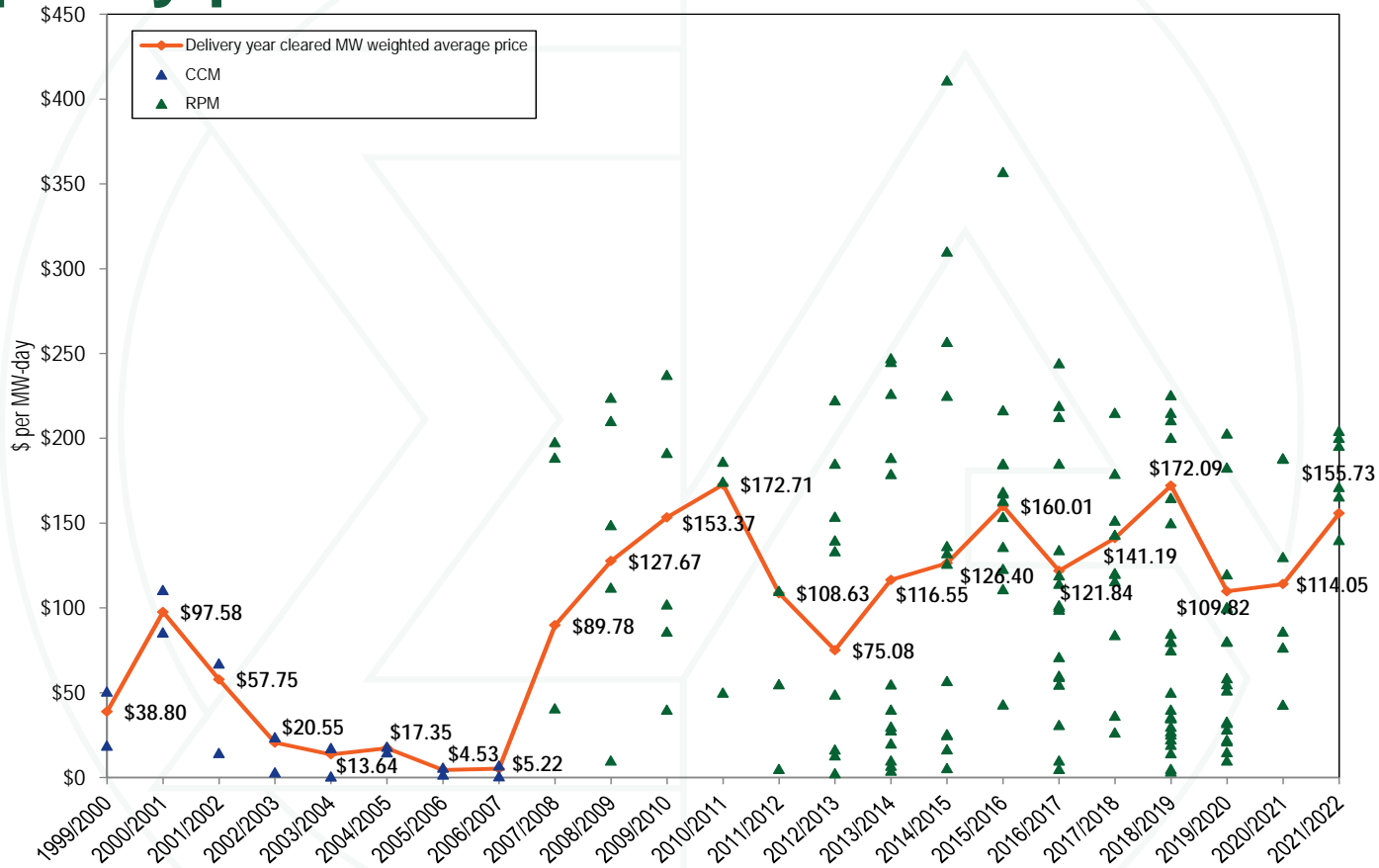
Fuel Diversity Index for installed capacity



PJM EFORd



Capacity prices

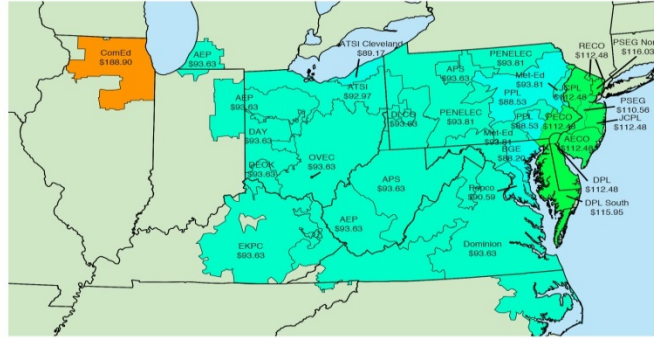


Capacity prices

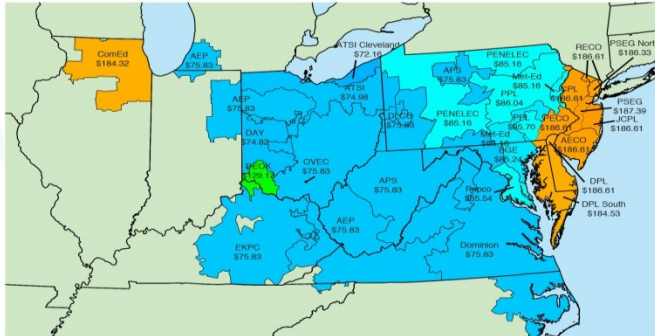
2018/2019



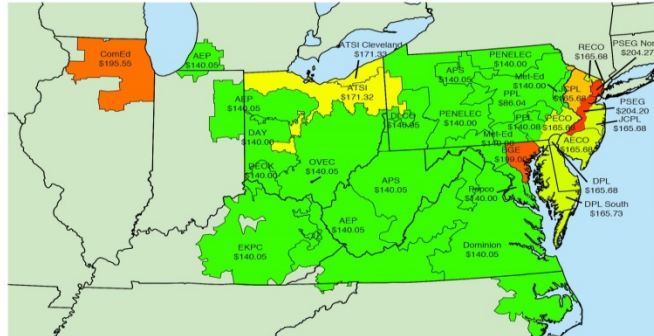
2019/2020



2020/2021



2021/2022



Energy net revenue for a new nuclear plant (\$/MW-year)

Zone	2014 (Jan-Jun)	2015 (Jan-Jun)	2016 (Jan-Jun)	2017 (Jan-Jun)	2018 (Jan-Jun)	2019 (Jan-Jun)	Change in 2019 from 2018
AECO	\$265,091	\$142,527	\$59,775	\$77,994	\$116,221	\$75,438	(35%)
AEP	\$190,891	\$112,394	\$70,532	\$82,292	\$116,628	\$80,771	(31%)
APS	\$213,794	\$132,923	\$74,094	\$84,025	\$127,195	\$81,714	(36%)
ATSI	\$202,329	\$115,700	\$70,888	\$85,307	\$123,701	\$82,850	(33%)
BGE	\$288,161	\$171,572	\$104,753	\$94,159	\$148,506	\$91,327	(39%)
ComEd	\$165,670	\$86,653	\$60,710	\$75,825	\$76,097	\$69,588	(9%)
DAY	\$192,110	\$111,674	\$70,986	\$84,326	\$120,415	\$85,001	(29%)
DEOK	\$182,574	\$107,801	\$68,747	\$80,603	\$127,634	\$81,259	(36%)
DLCO	\$176,246	\$104,093	\$68,723	\$82,921	\$123,035	\$80,379	(35%)
Dominion	\$249,960	\$154,475	\$84,656	\$89,727	\$143,295	\$86,623	(40%)
DPL	\$283,809	\$158,970	\$73,045	\$84,257	\$127,849	\$77,212	(40%)
EKPC	\$180,525	\$102,334	\$67,191	\$79,376	\$103,988	\$78,440	(25%)
JCPL	\$270,761	\$142,928	\$56,534	\$81,006	\$117,423	\$74,588	(36%)
Met-Ed	\$257,376	\$138,116	\$56,634	\$82,492	\$115,515	\$75,680	(34%)
PECO	\$260,534	\$139,277	\$54,417	\$77,959	\$116,210	\$72,692	(37%)
PENELEC	\$226,372	\$129,215	\$66,142	\$81,248	\$117,247	\$78,892	(33%)
Pepco	\$281,053	\$161,231	\$92,072	\$91,112	\$144,004	\$88,445	(39%)
PPL	\$258,425	\$138,562	\$56,625	\$79,569	\$111,850	\$70,397	(37%)
PSEG	\$290,672	\$151,524	\$59,471	\$82,200	\$121,207	\$76,830	(37%)
RECO	\$285,370	\$152,446	\$59,010	\$82,459	\$120,059	\$78,666	(34%)
PJM	\$236,086	\$132,721	\$68,750	\$82,943	\$120,904	\$79,340	(34%)

Nuclear unit forward annual surplus (shortfall)

	ICAP (MW)	Surplus (Shortfall) (\$/MWh)										
		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Beaver Valley	1,808	\$26.3	\$6.3	\$10.5	\$8.8	(\$3.3)	\$1.4	\$11.7	\$3.2	(\$0.6)	\$2.4	\$11.9
Braidwood	2,337	\$24.9	\$2.5	\$6.4	\$3.4	(\$6.1)	(\$2.6)	\$7.2	(\$1.2)	(\$3.4)	(\$1.7)	\$3.9
Byron	2,300	\$24.5	(\$1.3)	\$3.4	(\$0.6)	(\$9.4)	(\$3.6)	\$4.9	(\$6.1)	(\$9.7)	(\$2.9)	\$3.8
Calvert Cliffs	1,708	\$60.6	\$20.9	\$28.6	\$17.9	\$4.5	\$14.6	\$31.6	\$14.1	\$7.1	\$5.9	\$14.3
Cook	2,069	\$29.1	\$6.9	\$11.4	\$8.8	(\$3.6)	\$1.3	\$10.4	\$2.8	(\$0.7)	\$1.3	\$7.0
Davis Besse	894	NA	NA	NA	NA	(\$13.2)	(\$7.0)	\$6.6	(\$1.2)	(\$4.3)	(\$8.6)	(\$1.8)
Dresden	1,797	\$25.6	\$3.0	\$7.6	\$4.4	(\$5.2)	(\$1.0)	\$9.1	\$0.3	(\$1.8)	(\$0.4)	\$5.1
Hope Creek	1,172	\$54.0	\$17.0	\$24.5	\$16.9	\$2.6	\$12.4	\$26.0	\$6.3	(\$2.4)	\$1.2	\$10.0
LaSalle	2,271	\$24.8	\$2.5	\$6.4	\$3.3	(\$6.1)	(\$1.9)	\$7.7	(\$0.9)	(\$3.7)	(\$2.0)	\$4.0
Limerick	2,242	\$54.1	\$17.1	\$24.7	\$16.6	\$2.6	\$12.2	\$25.7	\$6.5	(\$2.2)	\$1.4	\$10.2
North Anna	1,892	\$52.0	\$14.6	\$25.5	\$16.8	\$0.2	\$5.7	\$23.2	\$10.9	\$2.8	\$4.6	\$14.0
Oyster Creek	608	\$47.5	\$8.4	\$15.9	\$7.2	(\$8.2)	\$3.3	\$16.4	(\$4.7)	(\$11.6)	(\$9.9)	NA
Peach Bottom	2,347	\$53.7	\$16.9	\$24.2	\$16.1	\$2.3	\$12.3	\$25.5	\$5.8	(\$2.5)	\$1.1	\$9.7
Perry	1,240	NA	NA	NA	NA	(\$13.2)	(\$6.4)	\$5.5	(\$0.3)	(\$4.2)	(\$7.6)	\$1.0
Quad Cities	1,819	\$24.1	(\$0.4)	\$2.4	(\$1.8)	(\$13.2)	(\$6.9)	\$0.6	(\$7.7)	(\$9.6)	(\$3.6)	\$2.4
Salem	2,328	\$54.0	\$17.1	\$24.5	\$16.9	\$2.6	\$12.4	\$26.0	\$6.2	(\$2.4)	\$1.1	\$10.0
Surry	1,676	\$48.8	\$13.8	\$24.2	\$16.4	(\$0.0)	\$5.1	\$21.6	\$10.8	\$2.4	\$4.4	\$14.0
Susquehanna	2,520	\$46.8	\$15.2	\$22.4	\$16.1	\$1.4	\$11.1	\$24.6	\$6.3	(\$1.9)	\$1.5	\$7.9
Three Mile Island	803	\$40.7	\$6.5	\$13.3	\$4.6	(\$9.6)	\$0.9	\$13.7	(\$6.8)	(\$12.4)	(\$10.3)	(\$4.5)

Nuclear unit forward annual surplus (shortfall)

	Surplus (Shortfall) (\$/MWh)		
	2019	2020	2021
Beaver Valley	\$1.40	\$0.78	\$1.38
Braidwood	\$1.24	(\$0.17)	(\$0.73)
Byron	\$1.18	(\$0.18)	(\$0.74)
Calvert Cliffs	\$2.13	\$1.43	\$1.99
Cook	(\$0.20)	(\$2.03)	(\$1.36)
Davis Besse	(\$10.39)	(\$11.78)	(\$10.32)
Dresden	\$2.06	\$0.67	\$0.09
Hope Creek	\$0.63	\$0.59	\$0.74
LaSalle	\$1.24	(\$0.17)	(\$0.73)
Limerick	\$0.75	\$0.63	\$0.78
North Anna	\$1.83	\$0.85	\$1.48
Peach Bottom	\$0.16	\$0.47	\$0.62
Perry	(\$9.62)	(\$10.44)	(\$9.04)
Quad Cities	\$0.28	(\$1.31)	(\$1.84)
Salem	\$0.62	\$0.57	\$0.72
Surry	\$1.52	\$0.70	\$1.34
Susquehanna	(\$2.58)	(\$2.93)	(\$2.31)
Three Mile Island	(\$12.95)	(\$15.10)	(\$14.49)

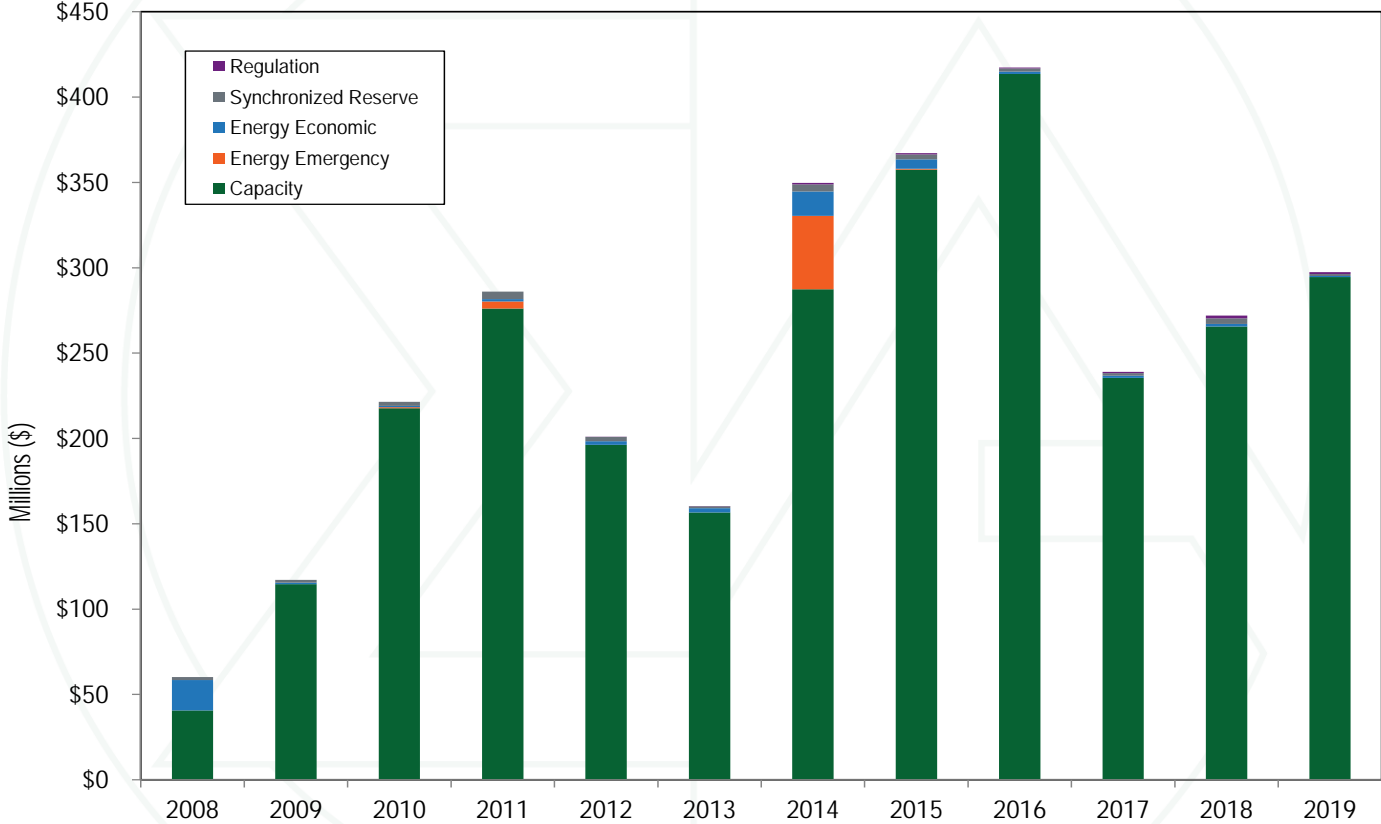
Nuclear unit forward annual surplus (shortfall)

	Surplus (Shortfall) (\$ in millions)		
	2019	2020	2021
Beaver Valley	\$20.8	\$11.7	\$20.6
Braidwood	\$24.0	(\$3.2)	(\$14.1)
Byron	\$22.3	(\$3.5)	(\$14.0)
Calvert Cliffs	\$30.0	\$20.3	\$28.0
Cook	(\$3.4)	(\$34.8)	(\$23.2)
Davis Besse	(\$76.6)	(\$87.1)	(\$76.2)
Dresden	\$30.5	\$9.9	\$1.3
Hope Creek	\$6.1	\$5.7	\$7.1
LaSalle	\$23.2	(\$3.2)	(\$13.7)
Limerick	\$13.8	\$11.7	\$14.5
North Anna	\$28.6	\$13.3	\$23.1
Peach Bottom	\$3.2	\$9.1	\$12.1
Perry	(\$98.5)	(\$107.1)	(\$92.5)
Quad Cities	\$4.2	(\$19.7)	(\$27.7)
Salem	\$12.0	\$10.9	\$13.8
Surry	\$21.0	\$9.7	\$18.5
Susquehanna	(\$53.7)	(\$61.1)	(\$48.0)
Three Mile Island	(\$85.8)	(\$100.3)	(\$96.0)

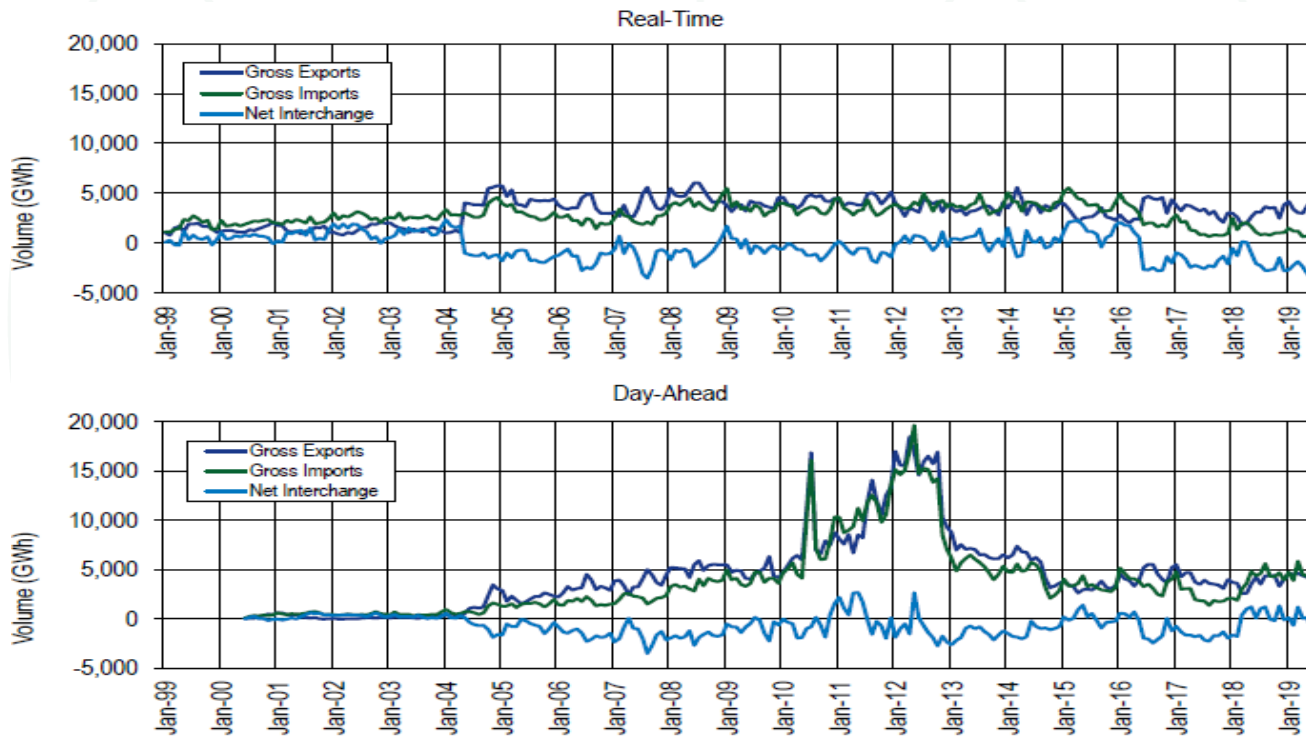
Reserve margin

	Generation and DR				Pool Wide			Generation and DR		Reserve Margin		Projected Replacement		Projected
	RPM Committed Less	Forecast	FRR	PRD	RPM Peak	IRM	Average	RPM Committed Less	Reserve	in Excess of IRM		Capacity using Cleared	Reserve	
	Deficiency UCAP (MW)	Peak Load	Peak Load		Load		EFORd	Deficiency ICAP (MW)	Margin	Percent	ICAP (MW)	Buy Bids UCAP (MW)	Margin	
01-Jun-16	160,883.3	152,356.6	12,511.6	0.0	139,845.0	16.4%	5.91%	170,988.7	22.3%	5.9%	8,209.2	0.0	22.3%	
01-Jun-17	163,872.0	153,230.1	12,837.5	0.0	140,392.6	16.6%	5.94%	174,220.7	24.1%	7.5%	10,522.9	0.0	24.1%	
01-Jun-18	161,242.6	152,407.9	12,732.9	0.0	139,675.0	16.1%	6.07%	171,662.5	22.9%	6.8%	9,499.8	0.0	22.9%	
01-Jun-19	162,276.1	151,643.5	12,284.2	0.0	139,359.3	16.0%	6.08%	172,781.2	24.0%	8.0%	11,124.4	0.0	24.0%	
01-Jun-20	165,943.4	151,155.1	11,930.9	558.0	138,666.2	15.9%	6.04%	176,610.7	27.4%	11.5%	15,896.6	3,454.4	24.7%	
01-Jun-21	160,795.3	152,647.4	12,107.1	510.0	140,030.3	15.8%	5.89%	170,858.9	22.0%	6.2%	8,703.8	0.0	22.0%	

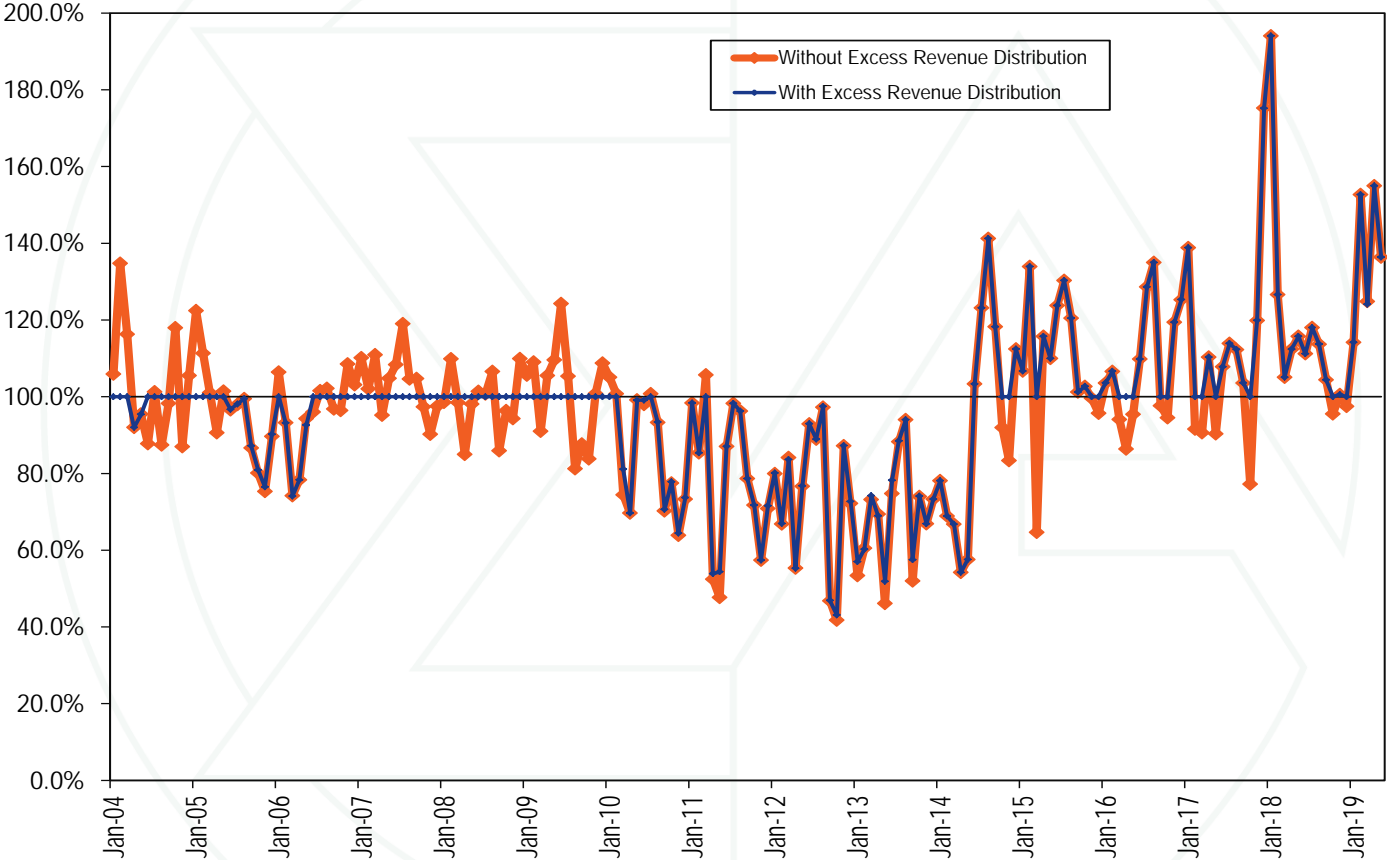
Demand response revenue by market



RT and DA scheduled import and export transaction volume history



FTR payout ratio



FTR payout ratio

Planning Period	FTR Payout Ratio
2003/2004	97.7%
2004/2005	100.0%
2005/2006	90.7%
2006/2007	100.0%
2007/2008	100.0%
2008/2009	100.0%
2009/2010	96.9%
2010/2011	85.0%
2011/2012	80.6%
2012/2013	67.8%
2013/2014	72.8%
2014/2015	100.0%
2015/2016	100.0%
2016/2017	100.0%
2017/2018	100.0%
2018/2019	100.0%

ARR holder total congestion offset (\$M)

Revenue					Pre 2017/2018 (Without Balancing)		2017/2018 (With Balancing)		Post 2017/2018 (With Surplus)	
Planning Period	ARR Credits	FTR Credits	Total Congestion	Excess Revenue	ARR/FTR Offset	Percent Offset	Revenue Received	Percent Offset	Revenue Received	New Offset
2011/2012	\$512.2	\$249.8	\$749.7	(\$192.5)	\$762.0	100.0%	\$598.6	79.8%	\$563.0	79.8%
2012/2013	\$349.5	\$181.9	\$524.8	(\$292.3)	\$531.4	100.0%	\$275.9	52.6%	\$257.5	52.6%
2013/2014	\$337.7	\$456.4	\$1,870.6	(\$678.7)	\$794.0	42.4%	\$574.1	30.7%	\$623.1	30.7%
2014/2015	\$482.4	\$404.4	\$1,357.6	\$139.6	\$886.8	65.3%	\$686.6	50.6%	\$715.0	52.7%
2015/2016	\$635.3	\$223.4	\$951.1	\$42.5	\$858.8	90.3%	\$744.8	78.3%	\$745.2	78.4%
2016/2017	\$640.0	\$169.1	\$780.8	\$72.6	\$809.1	100.0%	\$727.7	93.2%	\$763.8	97.8%
2017/2018	\$427.3	\$294.2	\$1,192.6	\$371.2	\$721.5	60.5%	\$595.7	50.0%	\$886.5	74.3%
2018/2019	\$529.1	\$130.1	\$680.0	\$112.3	\$675.93	99.4%	\$530.8	78.1%	\$626.3	92.1%
Total	\$3,913.6	\$2,109.2	\$8,107.3	(\$425.4)	\$6,039.5	74.5%	\$4,734.4	58.4%	\$5,180.5	63.9%

Estimated additional LTFTR auction revenue at annual FTR auction prices

Planning Period	Long Term FTR Product				Total Difference
	YR3	YR2	YR1	YRALL	
2014/2015	\$59,598,642	\$30,284,173	\$52,030,909	\$926,989	\$142,840,713
2015/2016	\$67,896,588	\$40,975,278	\$9,936,078	\$303,082	\$119,111,026
2016/2017	\$42,378,048	\$3,854,373	\$11,055,824	\$1,079,901	\$58,368,147
2017/2018	\$6,134,076	(\$1,841,715)	\$12,396,817	\$227,524	\$16,916,702
2018/2019	\$7,872,604	\$2,926,457	\$13,480,353	(\$111,226)	\$24,168,189
2019/2020	\$9,711,188	\$4,098,887	\$103,227,004	\$805,425	\$117,842,504
Total	\$183,879,959	\$76,198,567	\$98,899,981	\$2,426,270	\$361,404,776

Spinning Event Status

- **As of August 1, 2019, PJM has experienced only 7 spinning events.**
- **PJM has had no spinning events 10 minutes or longer since October 30, 2018.**
- **The average duration of spinning events in January through July 2019, is 8 minutes.**
- **None of the 7 spinning events in 2019 was caused by Low ACE.**
- **All of these metrics are the lowest in a decade.**

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