



Demand Response Opportunities in PJM's Markets

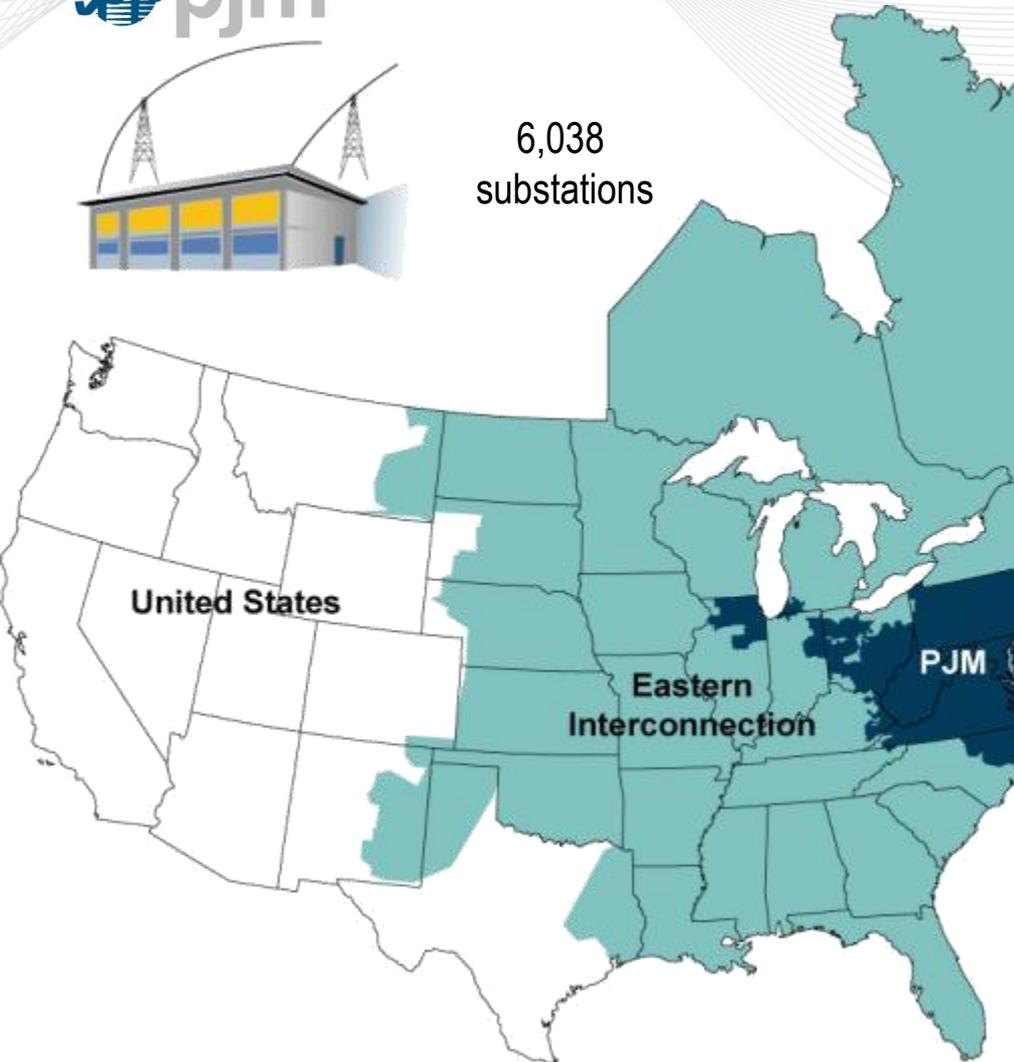
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Paul M. Sotkiewicz, Ph.D.
Chief Economist, Markets
PJM Interconnection, LLC



6,038
substations



KEY STATISTICS	
PJM member companies	600+
Millions of people served	51
Peak load in megawatts	144,644
MW of generating capacity	167,367
KMs of Transmission lines	90,520
GWh of annual energy	729,000
Generation sources	1,310
Square miles of territory	164,260
Area served	13 states + DC
Internal/external tie lines	250

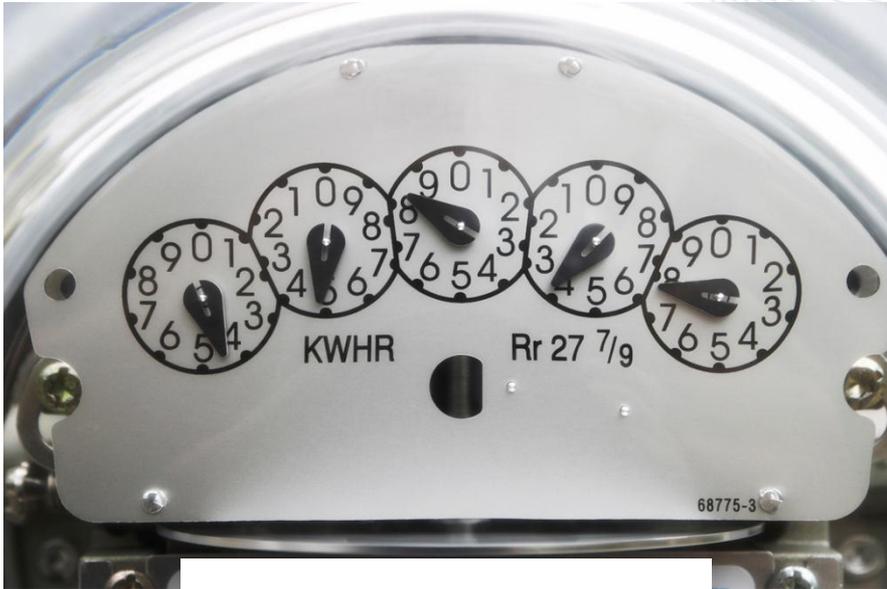
26% of generation in Eastern Interconnection

23% of load in Eastern Interconnection

19% of transmission assets in Eastern Interconnection

19% of U.S. GDP produced in PJM

What is Demand Response?



- Customer ability to manage total electricity bill
 - Reducing or shifting consumption away from high price periods to low price periods
 - In a manner similar to the gasoline example
 - Committing to reductions during peak to maintain reliability in exchange for a payment that reduces the total electricity bill
 - Similar to reducing recurring expenses for “infrastructure needs” such as with homes and cars

From a PJM operational perspective it is:

- End-use customer ability to change consumption in response to wholesale energy market prices
- End-use customer ability to reduce consumption to meet system generation capacity adequacy needs during an emergency



For utilities or load serving entities it is:

- End-use customer's ability to shift consumption to lower priced periods to reduce high price purchases or peaking generation
- End-use customer's ability to reduce consumption at peak to reduce the need for new generating capacity
- other end-use customers can also benefit from these actions

- PJM Energy Market

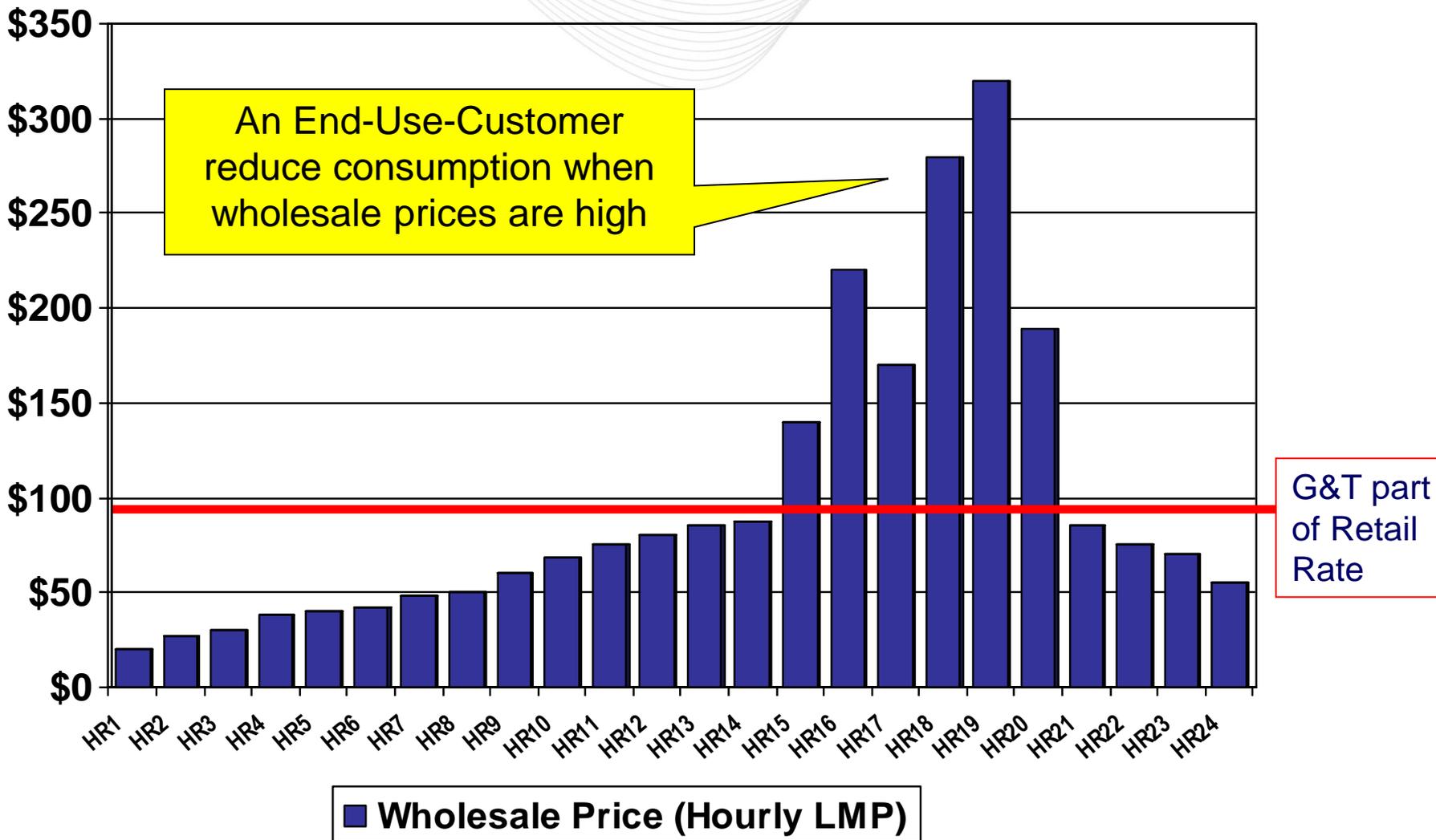
- End-use customers reduce consumption in response to wholesale market prices
- Reductions are compensated at the prevailing wholesale market price less the retail rate
- Participation is voluntary in that there is no requirement that reductions in consumption take place



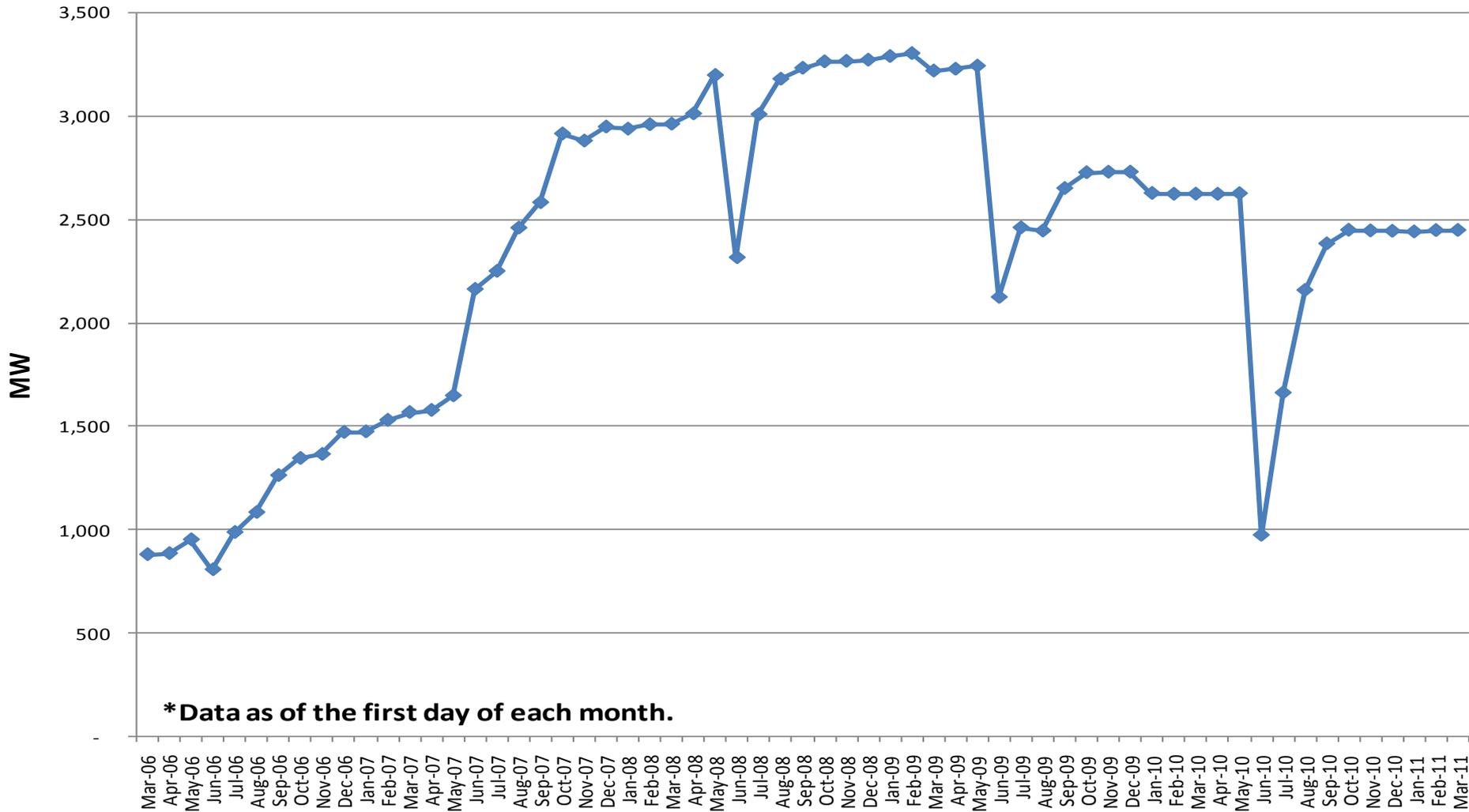
- PJM RPM Capacity Market

- End-use customers commit to reduce consumption during emergencies at extreme system peaks to maintain reliability
- End-use customers receive payment for making this commitment
- When called, reductions are mandatory





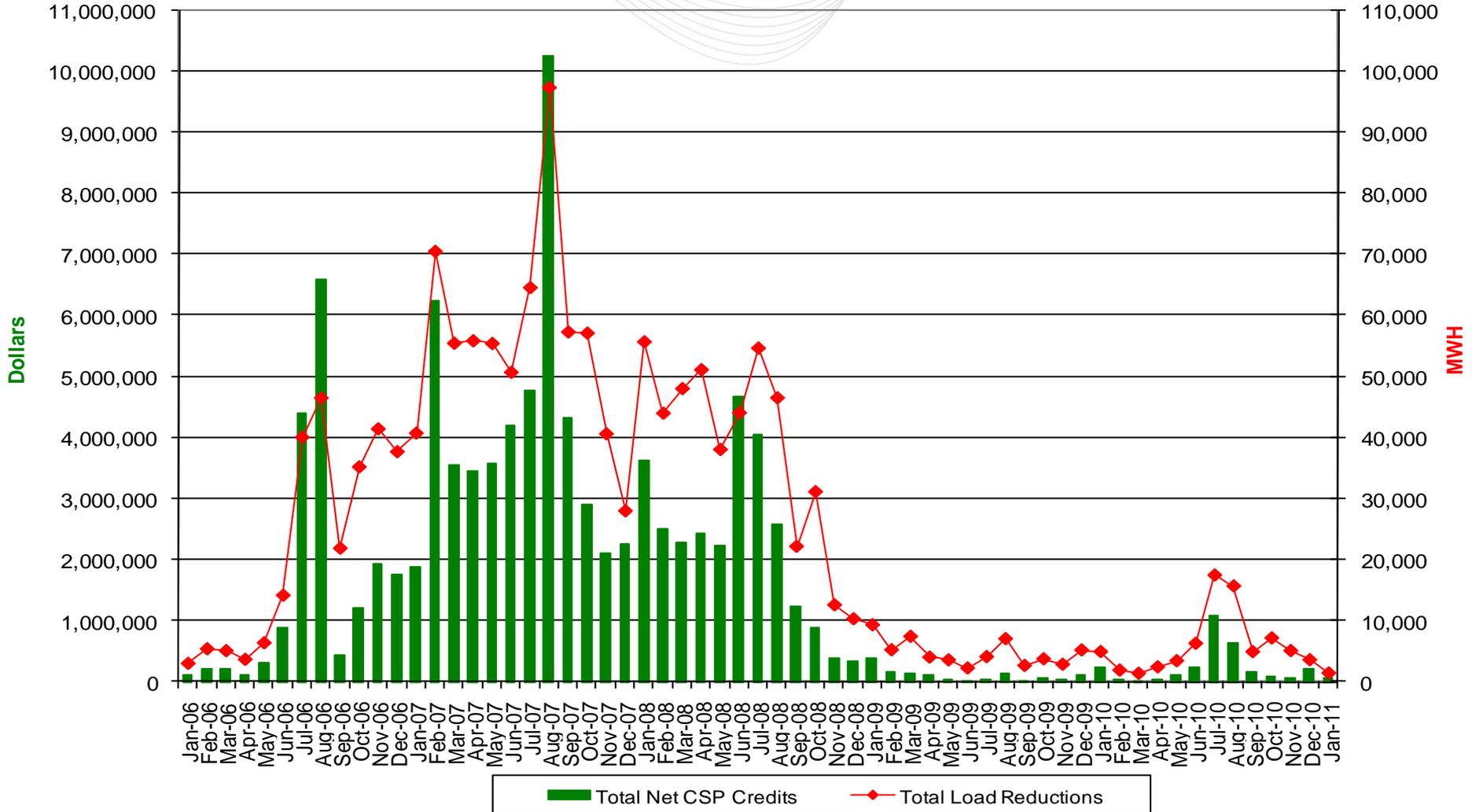
Total Registered MWs in PJM's Economic Demand Response



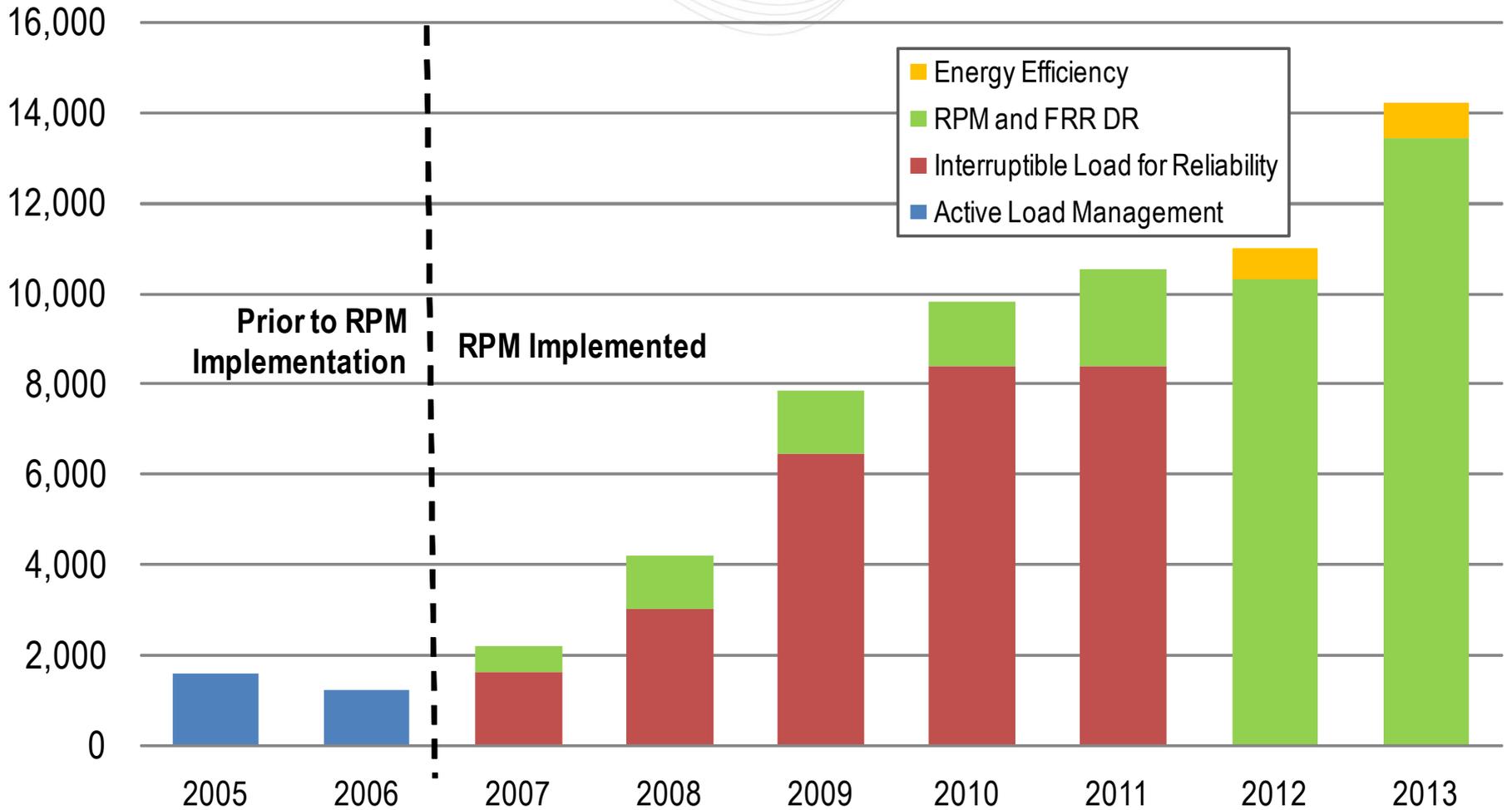
* Data as of the first day of each month.

PJM Economic Demand Response Activity

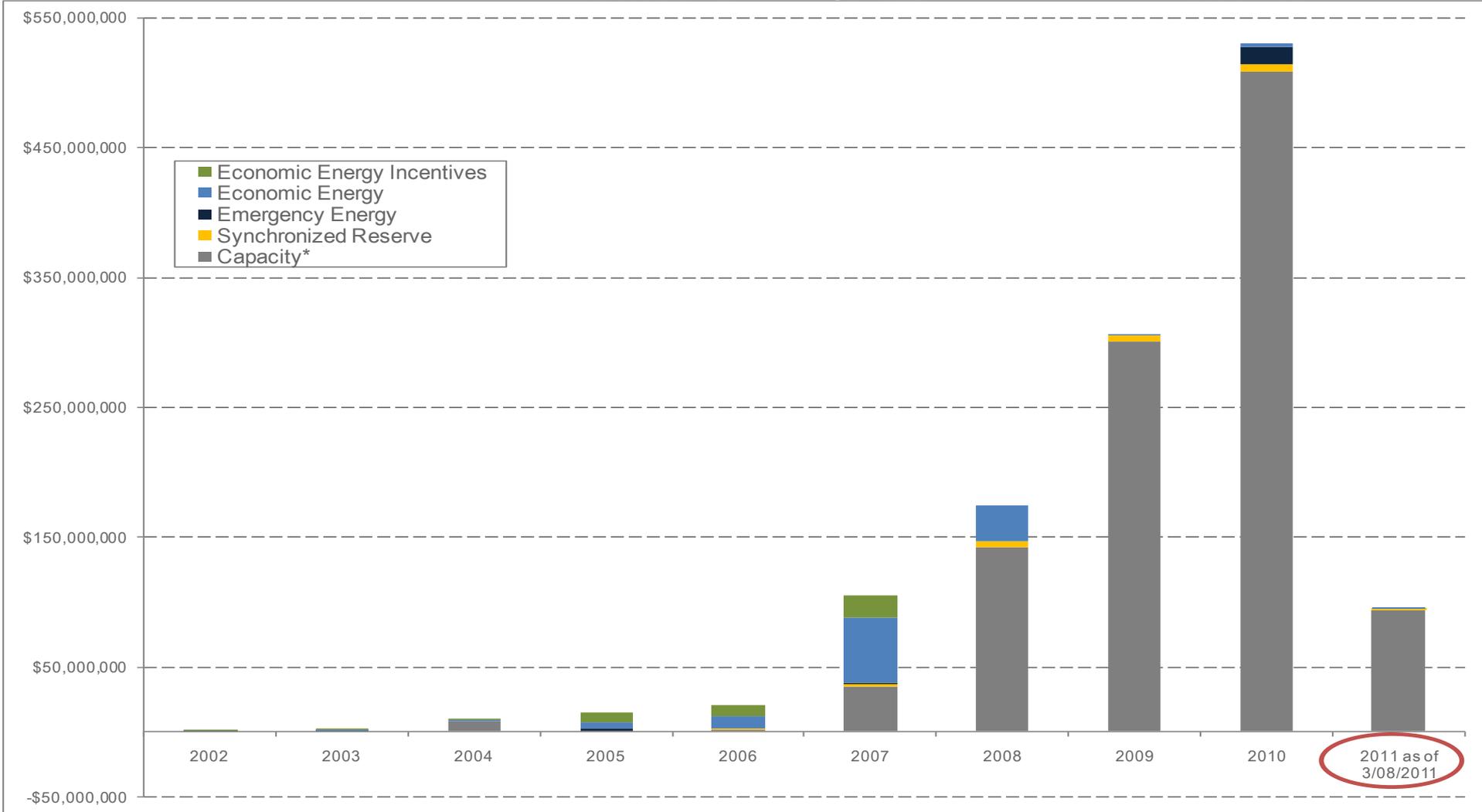
*Data for last few months are subject to significant change due to the settlement window.



Offers of Demand-Side Resources as Capacity in PJM by Delivery Year



PJM Demand Side Response Estimated Revenue



*Capacity revenue prior RPM implementation on 6/1/07 estimated based on average daily ALM capacity credits and weighted average daily PJM capacity market clearing price.

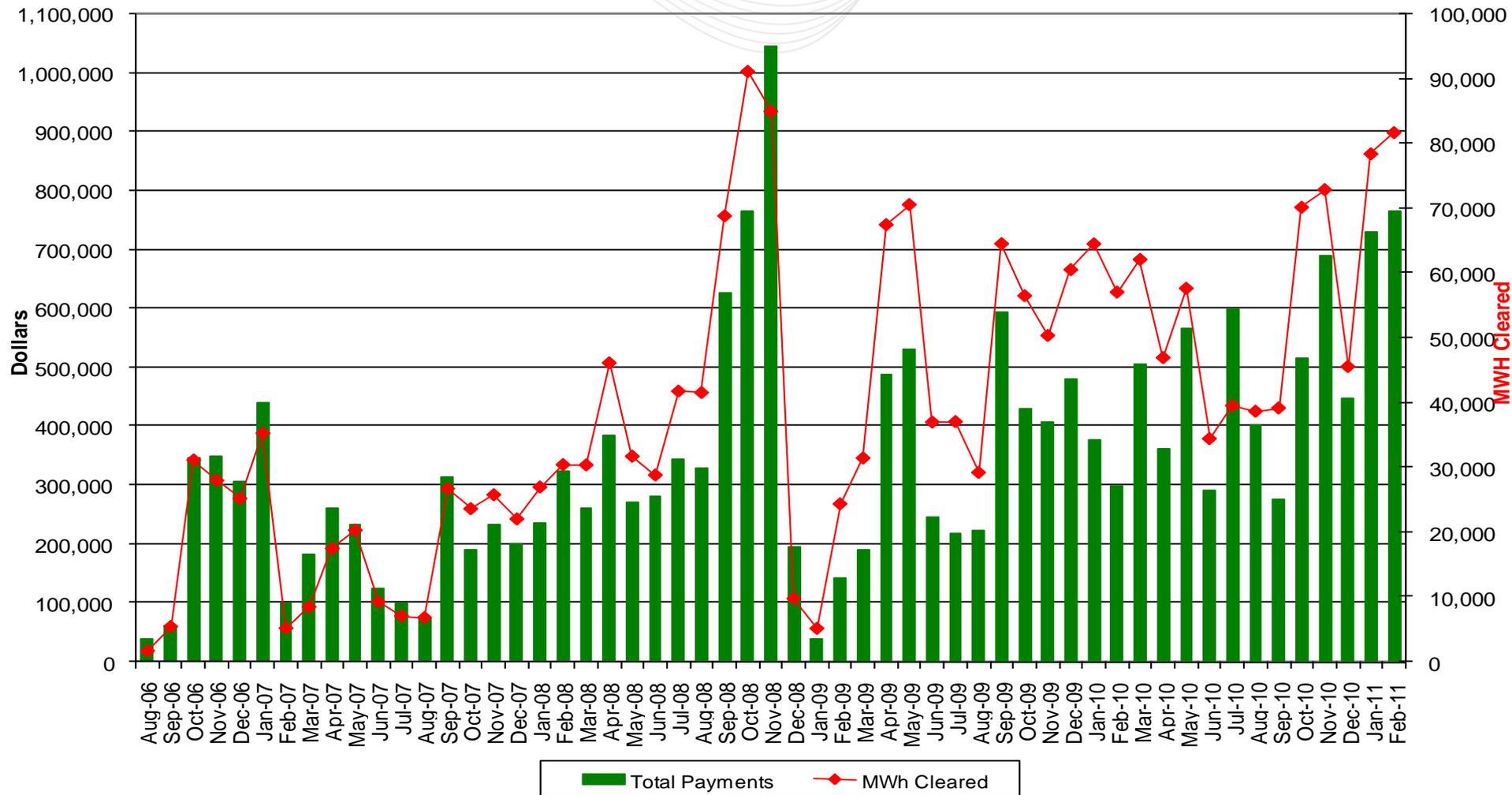
- PJM Synchronized Reserve Markets
 - As Synchronized Reserves end-use customers commit to reduce load in response to a contingency
 - End-use customers receive a payment for this commitment
 - If contingency occurs and PJM asks for reserve, reductions are mandatory

60.00 Hz

- PJM Regulation Market
 - End-use customers commit to follow PJM regulation and frequency response signal
 - End-use customers receive payment for this commitment
 - To date there has not been any demand response in regulation



DSR Participation in PJM Synchronized Reserve Markets

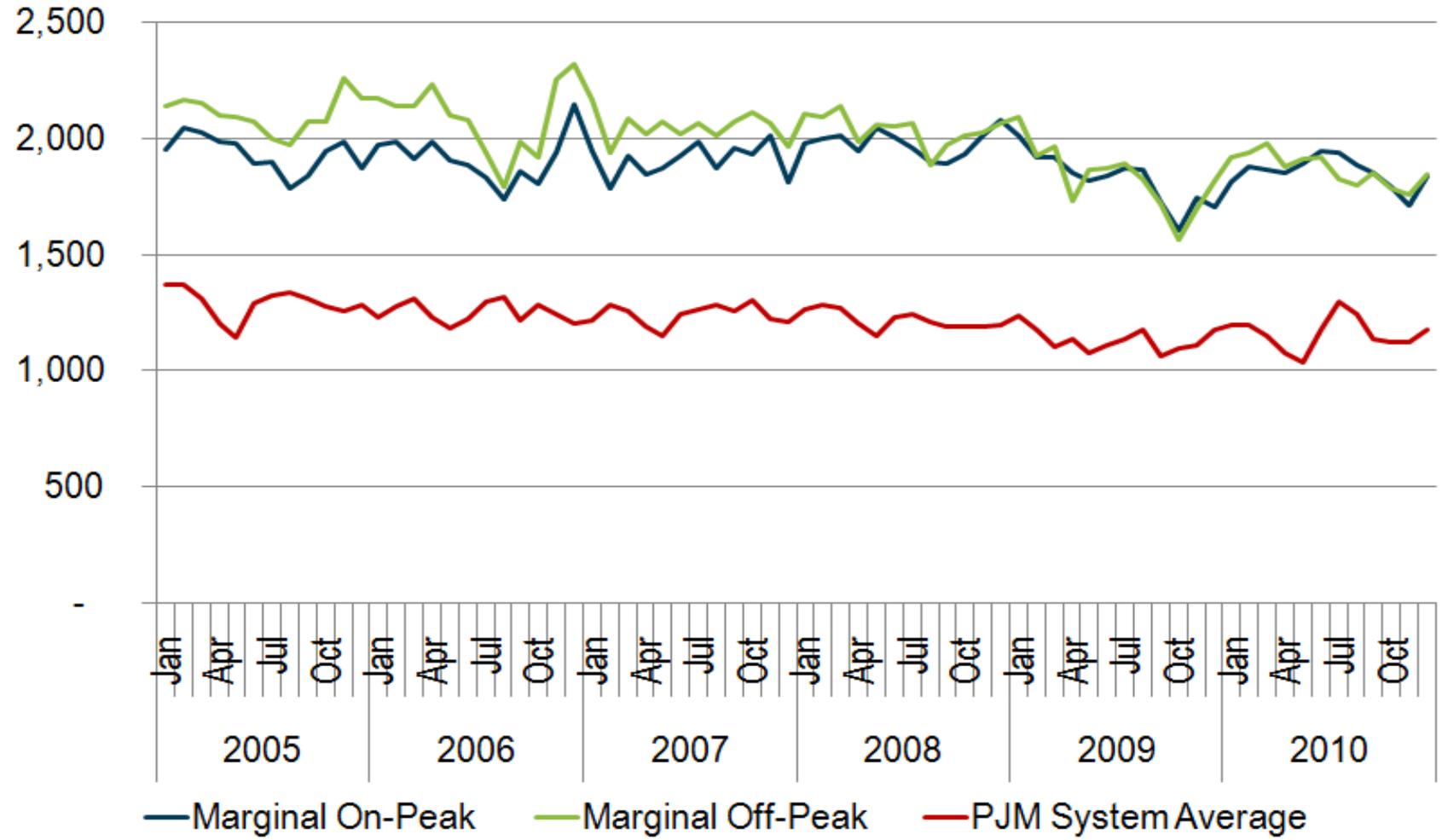


- **CO₂ Emissions Rates of Marginal Units** - PJM has analyzed the CO₂ emissions rate information from the Generation Attribute Tracking System (GATS), which is administered by PJM Environmental Information Services (PJM EIS), for the specific marginal units for each five minute interval from January 2005 through December 2010. The five-minute marginal data was aggregated into hourly blocks and then sorted into on-peak and off-peak time periods and ultimately averaged for each month. The on-peak period is all non-holiday weekdays from 7 a.m. until 11 pm and the off-peak is comprised of all other hours. The annual numbers are also provided.
- **Average CO₂ Emissions Rates** - The average CO₂ emissions rate is calculated with the CO₂ emissions rate information from GATS. Each unit's monthly generation numbers are coupled with the CO₂ rate to determine the total monthly emissions. The total CO₂ emissions values for all units are summed across the PJM region and divided by the total generation in the region to determine the average CO₂ emission rate in PJM for that month. The annual numbers are also provided.

CO₂ Emissions Rates of Marginal Units

Average CO₂ Emissions Rates

(lbs/MWh)





CO₂ Emissions Rates of Marginal Units

Average CO₂ Emissions Rates

(lbs/MWh)		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2005	Marginal On-Peak	1,952	2,047	2,026	1,986	1,979	1,892	1,897	1,783	1,842	1,948	1,988	1,875	1,934
	Marginal Off-Peak	2,140	2,164	2,155	2,102	2,094	2,077	1,999	1,974	2,074	2,071	2,263	2,177	2,107
	PJM System Average	1,368	1,366	1,311	1,205	1,141	1,290	1,325	1,334	1,306	1,278	1,254	1,285	1,292
2006	Marginal On-Peak	1,976	1,987	1,914	1,987	1,906	1,889	1,831	1,737	1,856	1,808	1,939	2,148	1,912
	Marginal Off-Peak	2,175	2,141	2,140	2,233	2,099	2,081	1,940	1,792	1,987	1,917	2,257	2,321	2,091
	PJM System Average	1,227	1,274	1,306	1,227	1,181	1,226	1,296	1,315	1,213	1,281	1,241	1,205	1,252
2007	Marginal On-Peak	1,946	1,787	1,927	1,843	1,874	1,925	1,988	1,873	1,963	1,932	2,017	1,810	1,908
	Marginal Off-Peak	2,165	1,939	2,086	2,023	2,071	2,023	2,065	2,013	2,071	2,114	2,069	1,969	2,051
	PJM System Average	1,218	1,285	1,256	1,192	1,149	1,240	1,265	1,279	1,259	1,304	1,222	1,212	1,242
2008	Marginal On-Peak	1,982	2,001	2,016	1,946	2,046	2,009	1,961	1,898	1,894	1,933	2,015	2,080	1,981
	Marginal Off-Peak	2,107	2,097	2,138	1,987	2,061	2,052	2,065	1,885	1,976	2,011	2,026	2,070	2,039
	PJM System Average	1,260	1,283	1,266	1,204	1,150	1,231	1,242	1,209	1,188	1,193	1,189	1,197	1,220
2009	Marginal On-Peak	2,015	1,919	1,917	1,853	1,817	1,838	1,875	1,864	1,727	1,604	1,743	1,703	1,823
	Marginal Off-Peak	2,092	1,926	1,964	1,731	1,867	1,876	1,893	1,824	1,721	1,566	1,698	1,817	1,831
	PJM System Average	1,234	1,174	1,105	1,137	1,076	1,112	1,139	1,175	1,065	1,097	1,111	1,179	1,137
2010	Marginal On-Peak	1,814	1,878	1,864	1,855	1,890	1,945	1,938	1,887	1,854	1,793	1,708	1,824	1,854
	Marginal Off-Peak	1,920	1,937	1,977	1,883	1,912	1,917	1,826	1,799	1,855	1,784	1,756	1,848	1,867
	PJM System Average	1,193	1,197	1,147	1,081	1,038	1,175	1,293	1,243	1,139	1,126	1,124	1,175	1,168

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