



INTRODUCTION TO PJM DEMAND RESPONSE

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From an operational perspective:

- It is the ability of consumers to change consumption in response to prices.
- It is the ability of consumers to reduce consumption in response to a notice from a system operator to meet system needs such as a contingency or emergency situation to maintain reliability.

From a customer perspective:

- It is the ability of consumers to control energy expenditures through reductions in consumption and price.
 - Reduction of consumption during high price events
 - Committing to reductions in usage during peak periods and/or for reliability needs

From a load serving entity (LSE) or electricity distribution company (EDC) perspective:

- It is the ability of consumers to help the LSE/EDC to avoid high cost purchases/production or avoid new capacity purchases/builds
 - Helps reduce overall costs for remaining LSE/EDC customers



PJM Market Participants in Demand Response

Load Serving Entity (LSE):

PJM Member, including Load aggregator or power marketer, serving end-users within the PJM Control Area, to sell electric energy to end-users with the PJM Control Areas.

Electric Distribution Company (EDC):

PJM Member that owns, or leases, electric distribution facilities that are used to provide electric distribution service to electric load within the PJM Control Areas.

End Use Customer:

*Cannot directly participate
Unless it is a PJM Member
(e.g. as an LSE or CSP)*

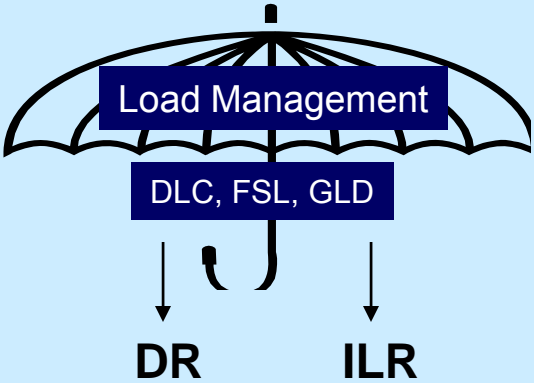
Curtailment Service Provider (CSP):

PJM Members that will act on behalf of end-use customers who wish to participate in PJM Load Response opportunities.

Who Can be a CSP?:

- Any LSE
- Any EDC
- Any third party (PJM member) specializing in Demand Response

- All participants (sites) must register with PJM
- PJM verifies the participant (site) has met all qualifications
- PJM asks the associated EDC/LSE for verification of certain information
 - LSEs and EDCs can deny a registration if the information cannot be verified or is incorrect
- If the site is subject to other contractual obligations, the CSP or site can work with PJM and the EDC/LSE to make alternate arrangements to avoid “double counting”

Energy	Capacity	Ancillary Services
<ul style="list-style-type: none"> • Economic Load Response Program (ELRP) • Emergency – Energy Only <p>Voluntary load reductions for <u>energy</u>, even during a PJM emergency event</p>	<ul style="list-style-type: none"> • Emergency – Capacity Only • Emergency – Full (also gets an energy payment) <p>Mandatory reduction for PJM Load Management emergency event</p> 	<ul style="list-style-type: none"> • Synchronous Reserves • Regulation • DA Scheduling Reserves <p>Load bids into these markets and responds to an event exactly like a generator</p> <p>Mandatory response to a Synchronous Reserve event if cleared in the Synchronous Reserve market</p>

OPTIONS

Day Ahead Market **

- CSP Submit Day Ahead Bid in eMKT
- PJM Notifies CSP via eMKT
- Obligated to perform in Real Time if Bid clears

Real Time Market

- CSP Notifies PJM via email one hour prior to reduction
- Voluntary Curtailment

Dispatched by PJM in Real Time

- CSP Submits operational info via eSuites
- PJM Notifies CSP via email

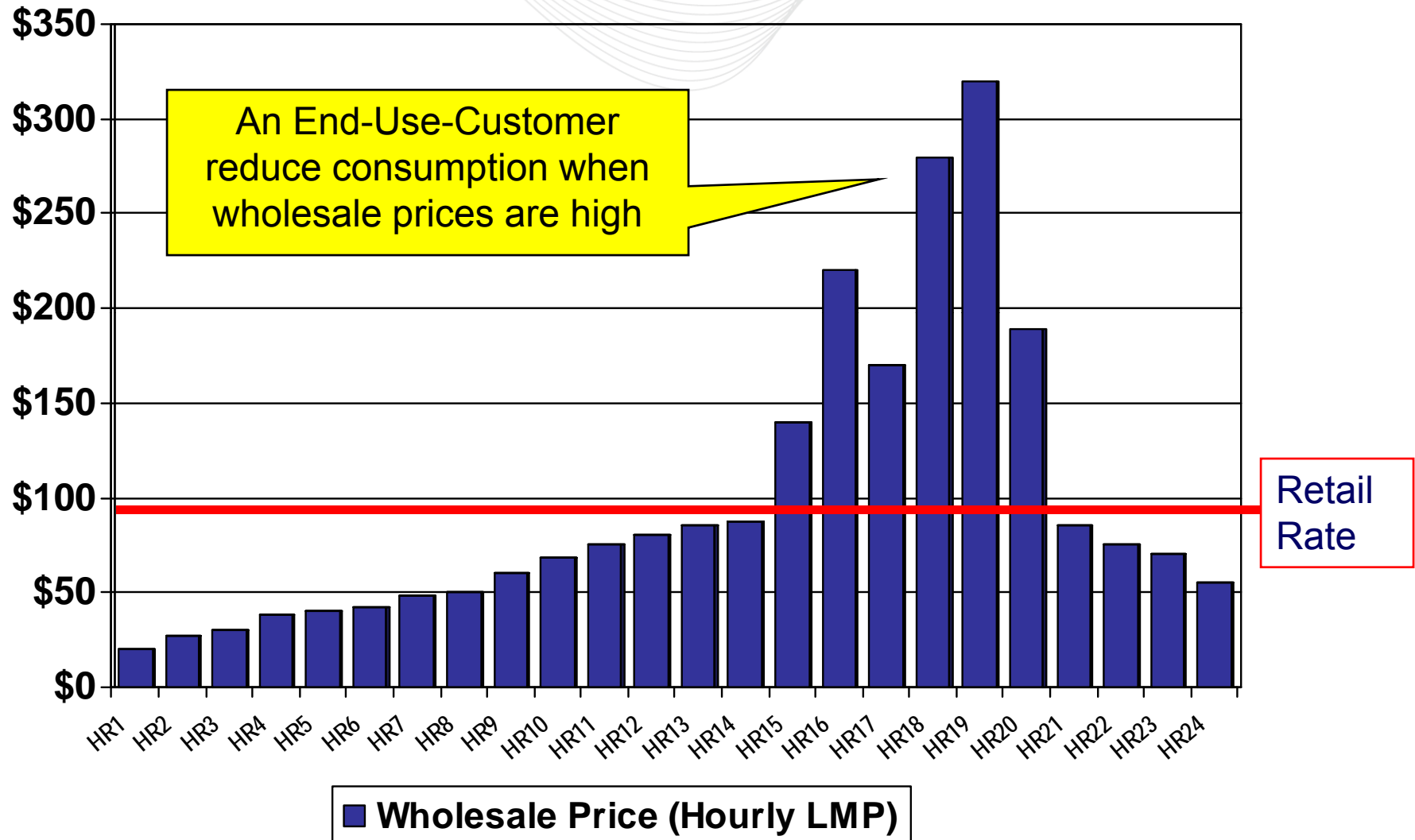
***Except Real Time LMP Based Customer*

PAYMENTS **

PJM pays Zonal LMP – Retail Rate

- Retail Rate = Generation + Transmission portion of the LSE retail charges (G & T)
- If dispatched (not self-scheduled) resource is ensured to recover all costs and be dispatched for minimum run time
- There are no longer any incentives paid in this program as they have expired on December 31, 2007.

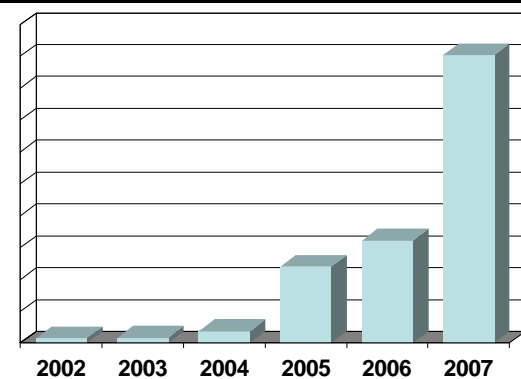
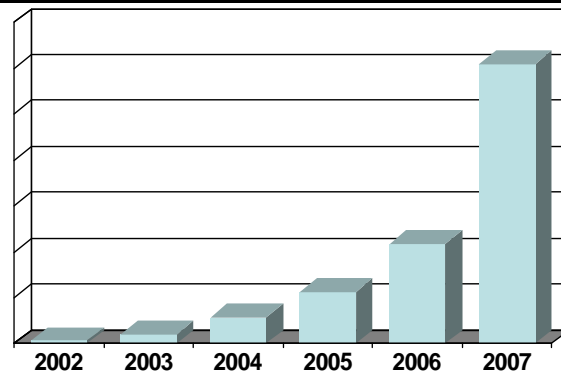
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Economic Load Response Program Evolution

	Total MWh	Total Payments
2002	6,727	\$801,119
2003	19,518	\$833,530
2004	58,352	\$1,917,202
2005	113,393	\$12,000,354
2006	217,056	\$16,118,042
2007	608,745	\$45,173,237



- The table below represents the total revenue a 1 MW Demand Resource could have generated from participation in the Economic Load Response Program at various retail rates (generation plus transmission) and strike prices, without any incentives, from March 1, 2007 to February 29, 2008

Trigger or Strike Price LMP (\$/MWh)				
		LMP \geq 75	LMP \geq 100	LMP \geq 125
Retail Rate (\$/MWh)	50	124,503	72,358	24,631
	75	66,503	50,458	20,381
	100	n/a	28,558	16,131

OPTIONS

Energy Only Option

- PJM sends notification of event via All Call to CSP
- Energy payment
- Voluntary Curtailment

Capacity Only Option

- PJM sends notification of event via All Call to CSP
- Capacity value
- Mandatory Curtailment

Full Emergency Option

- PJM sends notification of event via All Call to CSP
- Energy payment and capacity value
- Mandatory Curtailment

PAYMENTS

For Energy Only and Full Emergency Options PJM pays Zonal LMP

- Resource is ensured to recover all costs and be dispatched for minimum run time if called upon

For Capacity Only and Full Emergency Options PJM pays the associated capacity price

- This can differ by location or by program (ILR or DR)

Load Management

Three types of Load Management: DLC, FSL, GLD
Two options as Capacity Resources: ILR, DR

Interruptible Load for Reliability
(ILR)

Capacity resource (load)
certified outside of the RPM
auction

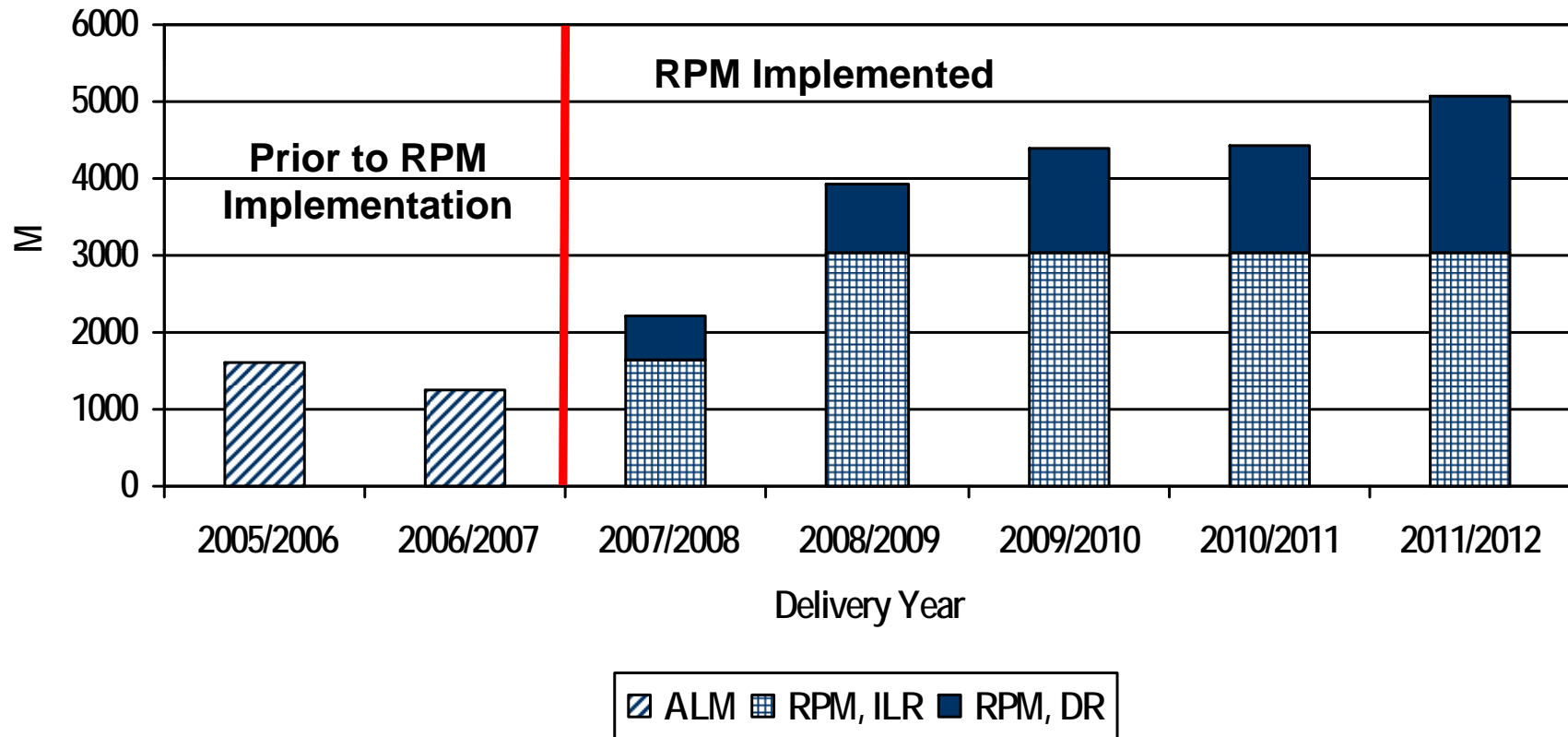
ILR will be certified
3 months prior to Delivery Year
and receive the **ILR Price**
tied to the zonal capacity charge.

Demand Resource
(DR)

Capacity resource (load)
that actively participates
in the RPM auction

Offered into RPM
Auctions. Receives the
**Capacity Resource
Clearing Price**

Participation Growth – Emergency (Capacity)





Revenue Opportunities as Capacity

Capacity Clearing Prices (\$/MW-day)			
	RTO	EMAAC	SWMAAC
2007/2008	40.80	197.67	188.54
2008/2009	111.92	148.80	210.11
2009/2010	102.04	191.32	237.33
2010/2011	174.29	174.29	174.29
2011/2012	110.00	110.00	110.00

Resulting Annual Revenue (\$/MW-year)			
	RTO	EMAAC	SWMAAC
2007/2008	14,892	72,150	68,817
2008/2009	40,851	54,312	76,690
2009/2010	37,245	69,832	86,625
2010/2011	63,616	63,616	63,616
2011/2012	40,260	40,260	40,260

OPTIONS AND PAYMENTS

Synchronous Reserves

- Commitment to respond to a PJM all-call due to a system contingency within 10 minutes
- Paid the market clearing price inclusive of opportunity costs

Regulation (Frequency Response)

- Respond to regulation signals as needed to keep system at 60 Hz
- Paid market clearing price inclusive of opportunity costs

Day-ahead Scheduling Reserve

- Commitment to be available to respond within 30 minutes of a signal to respond in real-time
- Paid market clearing price inclusive of opportunity costs

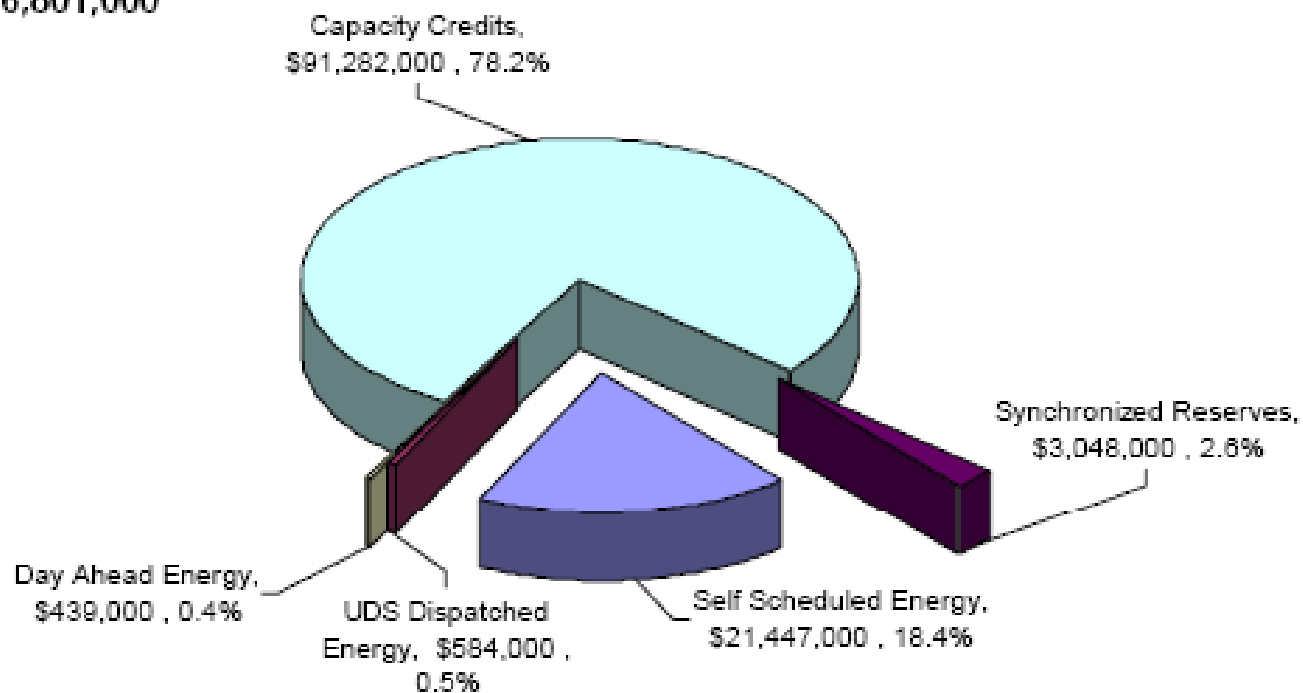
For the period March 1, 2007 to February 29, 2008

- For a 1 MW resource clearing Synchronous Reserve in all hours
 - RFC \$39, Mid-Atlantic subzone \$52,381, Dominion \$232
- For a 1 MW resources clearing in Regulation when the price (inclusive of opportunity cost) exceeds \$100/MW
 - \$47,306 for 305 hours
 - To date there has been no Demand Resource that has bid into Regulation
- For Day-ahead Scheduling Reserve (operating since June 1, 2008 through August 31, 2008) \$1,236

Demand Response Market Size

2008 YTD Demand Side Response Market Size Data

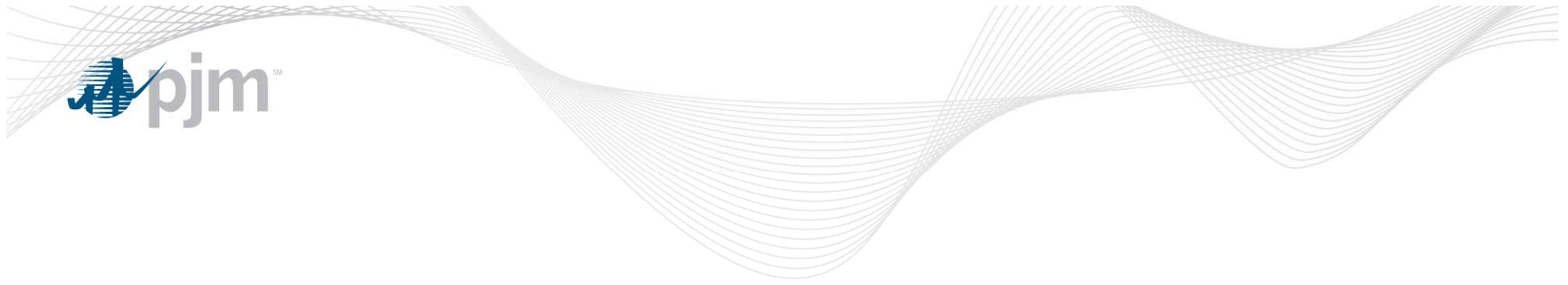
Total: \$116,801,000



Potential benefits of demand response:

- Increased customer control of energy costs and reduced bill volatility
- Operational savings for EDCs and LSEs
- Lower market prices and reduced price volatility
- Enhanced grid reliability
- Potential environmental benefits





Questions?