



Demand Response and RPM Capacity Market in PJM

OTC Meeting, Newark NJ
January 11, 2007

“ Customers in the 13-state PJM region set a new record for power consumption of 144,796 megawatts on Aug. 2. On that day alone, voluntary reductions in electricity use, known as demand response, resulted in price reductions estimated to be equivalent to more than \$230 million in payments for energy.”

Quantity of fuel displaced by voluntary Load Reduction
July 31, 2006 through August 3, 2006

- Coal



1367 Tons
(3000 Tons CO2)

- Oil



15,855 Barrels
(2600 Tons CO2)

- Natural Gas



227,965 MCF
(1500 Tons CO2)

Electricity Price Reduction impact -

Equivalent Consumer savings = \$650 Million in reduced energy payments based on electricity spot price reductions due to voluntary demand response for period from July 31, 2006 through August 3, 2006



2006 Economic Demand Side Response Monthly MWh Reductions

Zone	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	
AECO							130	389		
AEP					1,895			135		
APS	1,536	3,096	2,640	273	1,523	4,736	10,459	7,482		
BGE					8	1,128	14,186	15,599	172	
COMED			252	1,220	1,088	729	1,552	2,361	37	
DAY							236	238		
DOM		12	4		410	4,481	7,004	102		
DPL	769	774	977	842	36	32	302	289		
DUQ							84			
JCPL		174	272	45			232	136		
METED							49	18		
PECO	11	293	156	142	911	2,052	1,335	6,018	3,645	
PENELEC					3		129	18		
PEPCO						336	792	1,030		
PPL	221	4		589	2	319	611	291	3	
PSEG	438	820	752	522	476	292	2,216	2,798		
Total	2,975	5,172	5,052	3,634	6,352	14,105	39,317	36,903	3,857	117,367

- Deployment of Advanced Metering Infrastructure including interval meters
- More timely access to meter data
- More dynamic pricing for retail customers
- Removal of electric distribution company disincentives, thru-put paradigm
- Cost of enabling technology
- Broadening the focus on energy efficiency to include demand response

States

- Metering infrastructure
- Provide access to meter data
- DSR options thru POLR designs
- Distribution system rate making
- Retail rate design
- Portfolio standards

PJM/FERC

- Provide market opportunities to monetize DSR
 - Energy, capacity, ancillary services

EMERGENCY

PJM Emergency event
PJM posts Emergency
Message
(Energy Only option and Full
Emergency option both became
available June 1, 2006)

ECONOMIC**

Day Ahead Market

- Customer Submit Day Ahead Bid in eMKT
- PJM Notifies Customer via eMKT
- Obligated in Real Time if Bid clears

Real Time Market

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

Dispatched by PJM in Real Time

- Customer Submits operational info via eSuites
- PJM Notifies Customer via phone

****Except LMP Index price consumers**

Comparison of Revenue Opportunities for Demand Response Current vs. Revised

Revenue Opportunity	PJM (before)	PJM with new initiatives
Real-Time/Spot Energy Sales	Yes	Yes
Day-Ahead Energy Sales	Yes	Yes
Forward Energy Sales	No	Yes; Proposed Forward Energy Reserve Market
Forward Capacity Sales	Limited by small volume and to current planning year	Yes; Proposed RPM auction fixes problems
Energy & Capacity payment for emergencies	Not in all cases	Yes; Emergency program changes ensure payment
Ancillary Services	No	Yes; Spin & Regulation

Comparison of Revenue Opportunities for Revised Demand Response vs. Generation

Revenue Opportunity	PJM with new initiatives	Central Station Generation (PJM)
Real-Time/Spot Energy Sales	Yes	Yes
Day-Ahead Energy Sales	Yes	Yes
Forward Capacity Sales	Yes; Proposed RPM auction fixes small volume problems	Yes, Bi-lateral market liquid up to 3 years
Energy & Capacity payment for emergencies	Yes; Emergency program changes ensure payment	Yes; always
Ancillary Services	Yes; Spin & Regulation	Yes; Spin, regulation, black start, etc...

	Aug.	Sept.	Oct.
MWhs	1,793	6,748.9	39,479.1
Payments	\$44,451	\$77,556	\$451,849



PJM Capacity Market Evolution

- One price fits all
 - Not coupled to Locational Value
 - Not coupled to operational reliability
 - Not coupled to value provided
- Insufficient information to drive behavior
- Limited forward certainty



- Generation Net Revenue Shortfall
- Inconsistency between capacity pricing and reliability requirements
- Result has been
 - Generation Retirement
 - Lack of New Capacity
 - Need for short-term corrective action
- Upcoming Reliability Violations

Unit Type	20 Year Levelized Fixed Cost	Realistic Dispatch Average Net Rev 1999 to 2004
Combustion Turbine (CT)	\$72,207	\$36,195
Combined Cycle (CC)	\$93,549	\$52,243
Pulverized Coal (CP)	\$208,247	\$137,015

Table values are from PJM 2005 State of the Market report

- Must have an integrated solution – need generation and transmission
 - Cannot build enough transmission fast enough to resolve problems
- Need locational price signals
 - Need to build generation in proper location based on deliverability shortfall
- Need price signals and sufficient lead time
 - Generators must have sufficient incentives and time to respond in order to compete with transmission

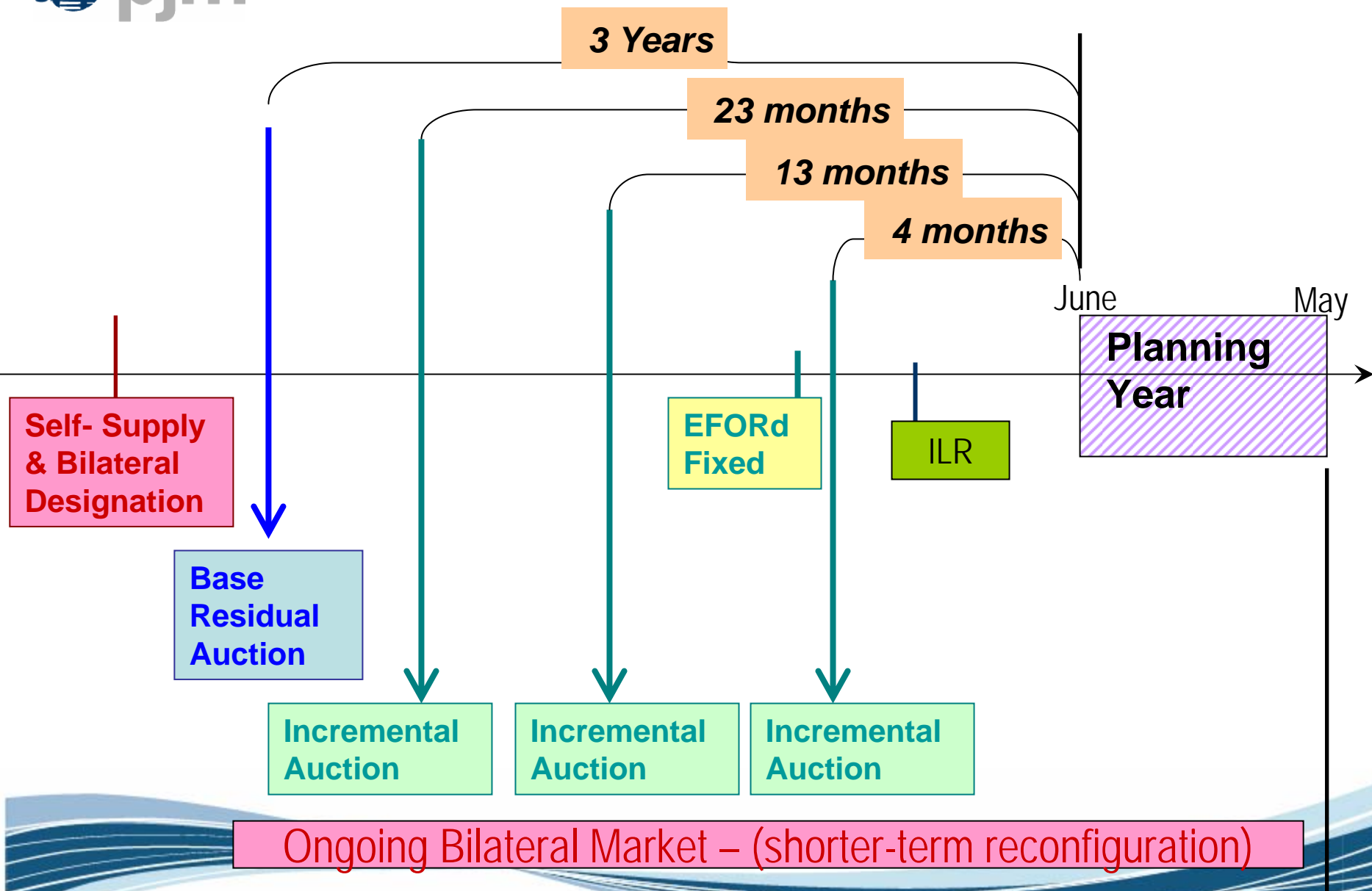
- PJM RAM Stakeholder Working Group
- PJM Filed RPM in August, 2005
- FERC Ruling
- FERC Settlement in Summer of 2006
- FERC Settlement Agreement filed September, 2006
- RPM Tariff Language filed September, 2006

- Dec, 2006 – FERC Ruling
- Feb, 2007 – Training Begins
- Mar, 2007 – eRPM System on-line
- Mar, 2007 – Market Trials
- Apr, 2007 – Base Residual Auction
- Jun, 2007 – eCapacity Retired
- Jun, 2007 – RPM Delivery Year

- Allows generation, demand response, and transmission to participate
- Existing and planned resources allowed to offer into auctions
- Optimization will choose most economical solution

- Forward auctions
 - residual procurement after specification of self-supply and bilaterals
 - cleared based on generation offers and demand obligation
 - Capacity procured three years in advance of delivery year
 - Capacity committed for one year

- **First Incremental Auction**
 - Allows committed resources to buy out of their commitments
- **Second Incremental Auction**
 - Correction for load forecast error
- **Third Incremental Auction**
 - Last chance for committed resources to buy out of their commitments



- Locational regions determined from Reliability Assessment
- Uses CETO/CETL margin to determine candidate Locational Deliverability Areas (LDAs)
- VRR Curve developed for each LDA
- Each resource is located within a LDA

- Provides integrated Demand Response participation
- Incentivizes new resources to offer into Forward Auction
- Allows merchant Transmission solutions to offer incremental import capability into constrained areas to compete with generation solutions
- Provides stable capacity price signal to incentivize sustained investment where needed