Combined Heat and Power demand response opportunities in PJM wholesale markets

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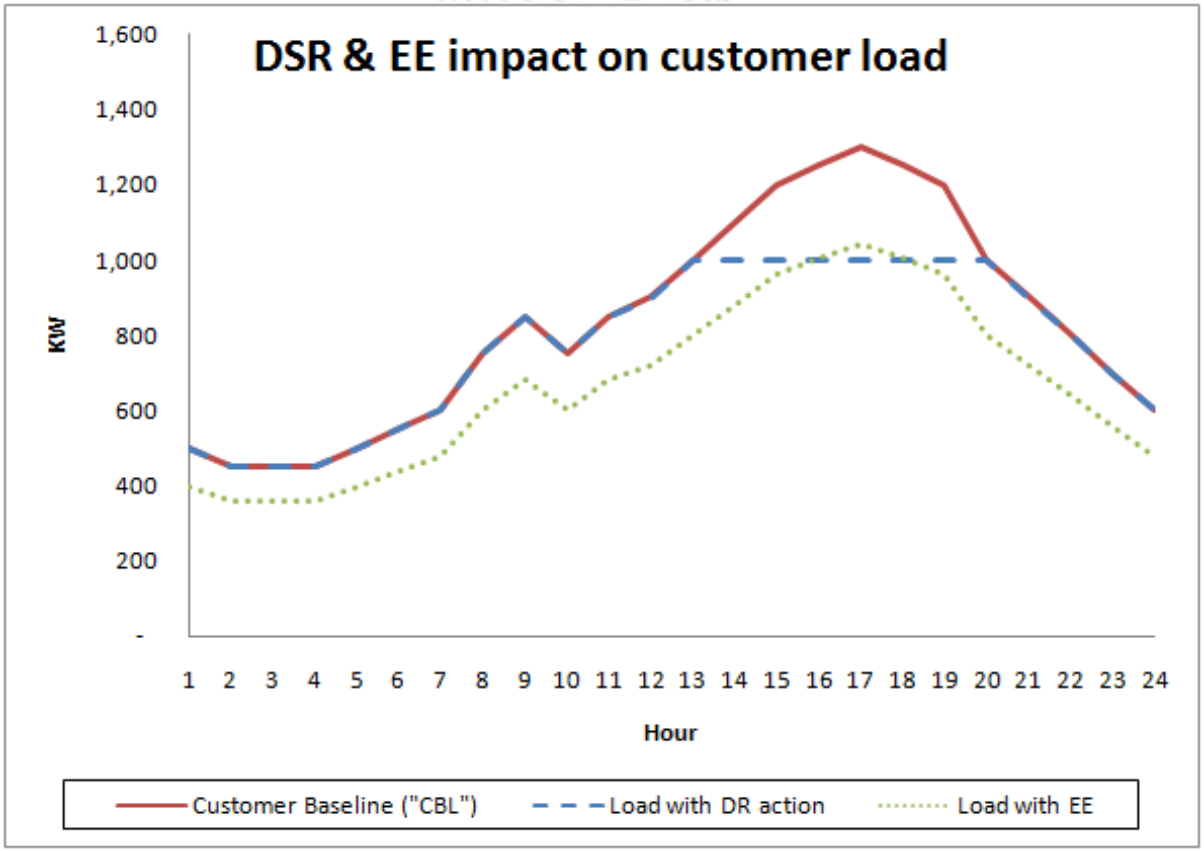
Demand Side Response and Energy Efficiency



DSR & EE participation based on change to load behind retail meter – does not include injections into grid

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How are load reductions accomplished?

- Key sources of Demand Response
  - Cooling
  - Heating
  - Ventilation
  - Lighting
  - Manufacturing process
  - Generation (back up gen or potentially CH&P)
- Demand response represents reduction in electricity consumption based on PJM instructions or prices
  - PJM does not differentiate based on “how” the load reduction is accomplish

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PJM Opportunity by Wholesale Service

Wholesale Service	Demand Side Response	Energy Efficiency	Price Responsive Demand*
Capacity	Yes	Yes	yes
Energy	Yes		
Day Ahead Scheduling Reserves (30 min)	Yes		
Synchronized Reserves (10 min)	Yes		
Regulation	Yes		

Emergency resource

Economic resource

Customer may participate as Emergency and Economic DSR and as EE

**PRD approved by members and waiting FERC approval*

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Market Structure – who does what?

Energy Efficiency Provider (EERP):

Energy efficiency activity by the customer.

Curtailment Service Provider (CSP):

Demand side response activity by the customer.

End Use Customer

Load Serving Entity (LSE):

Electricity supply to the customer.

Electric Distribution Company (EDC):

Distribution assets used to distribute the electricity to the customer.

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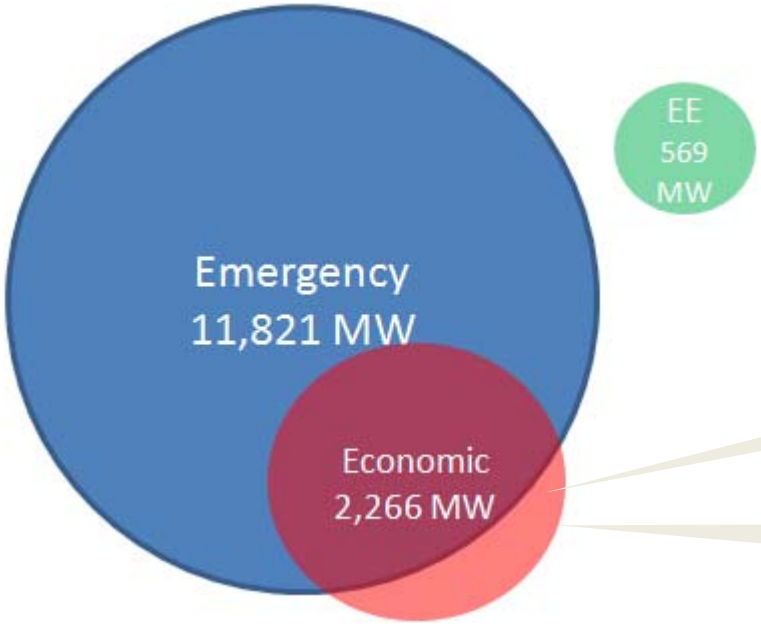
Current (2011) DSR capability ~ 8% of System Peak Load



Note:12/13 DY (1rst time in RPM auction)

0.2 MW Regulation

~200 MW Sync Reserves

Represents over 1 million end use customers (~14,000 C&I) across PJM

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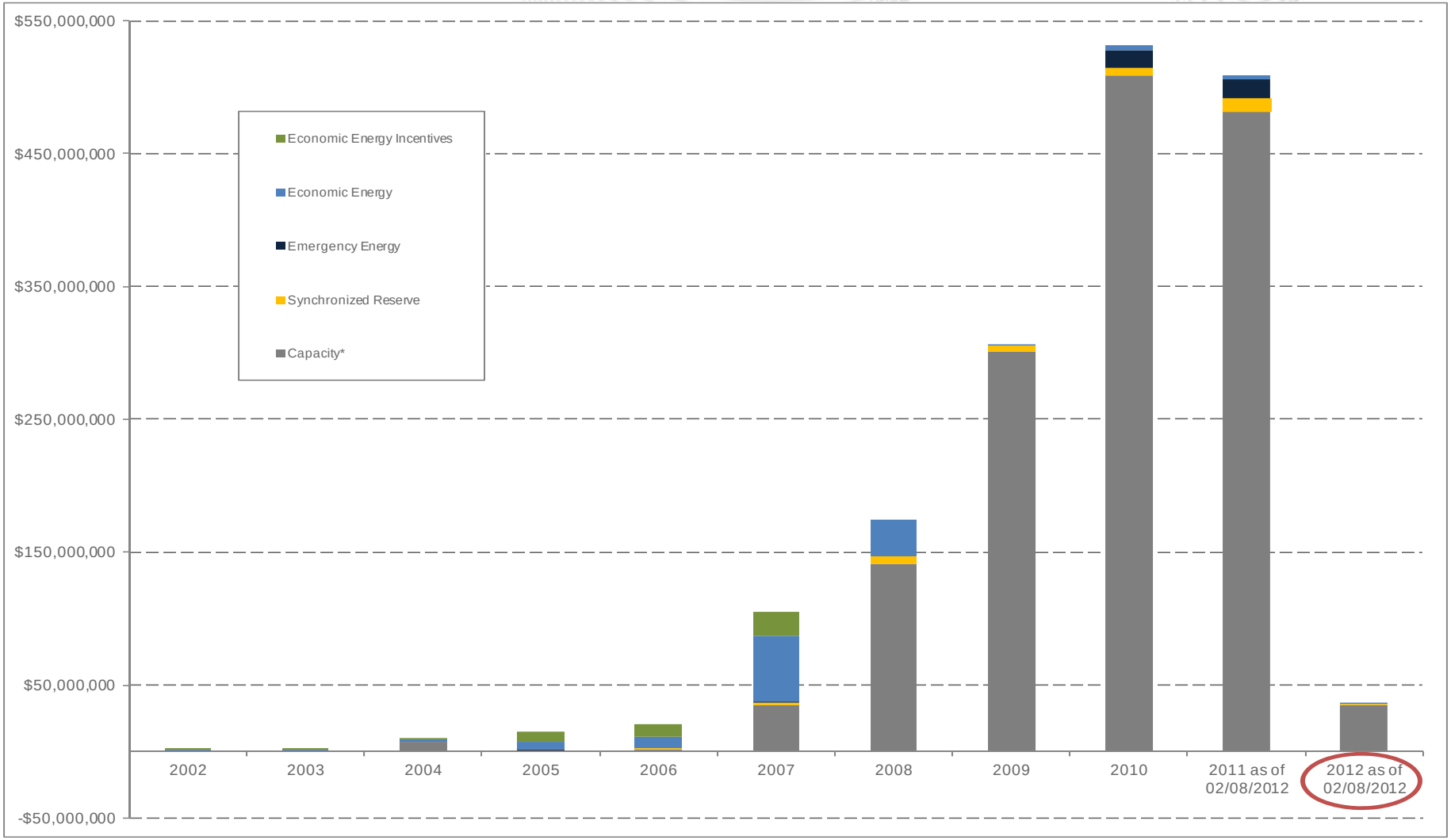
PJM Demand Side Response Estimated Revenue



*Capacity Net Revenue inclusive of Capacity Credits and Charges.

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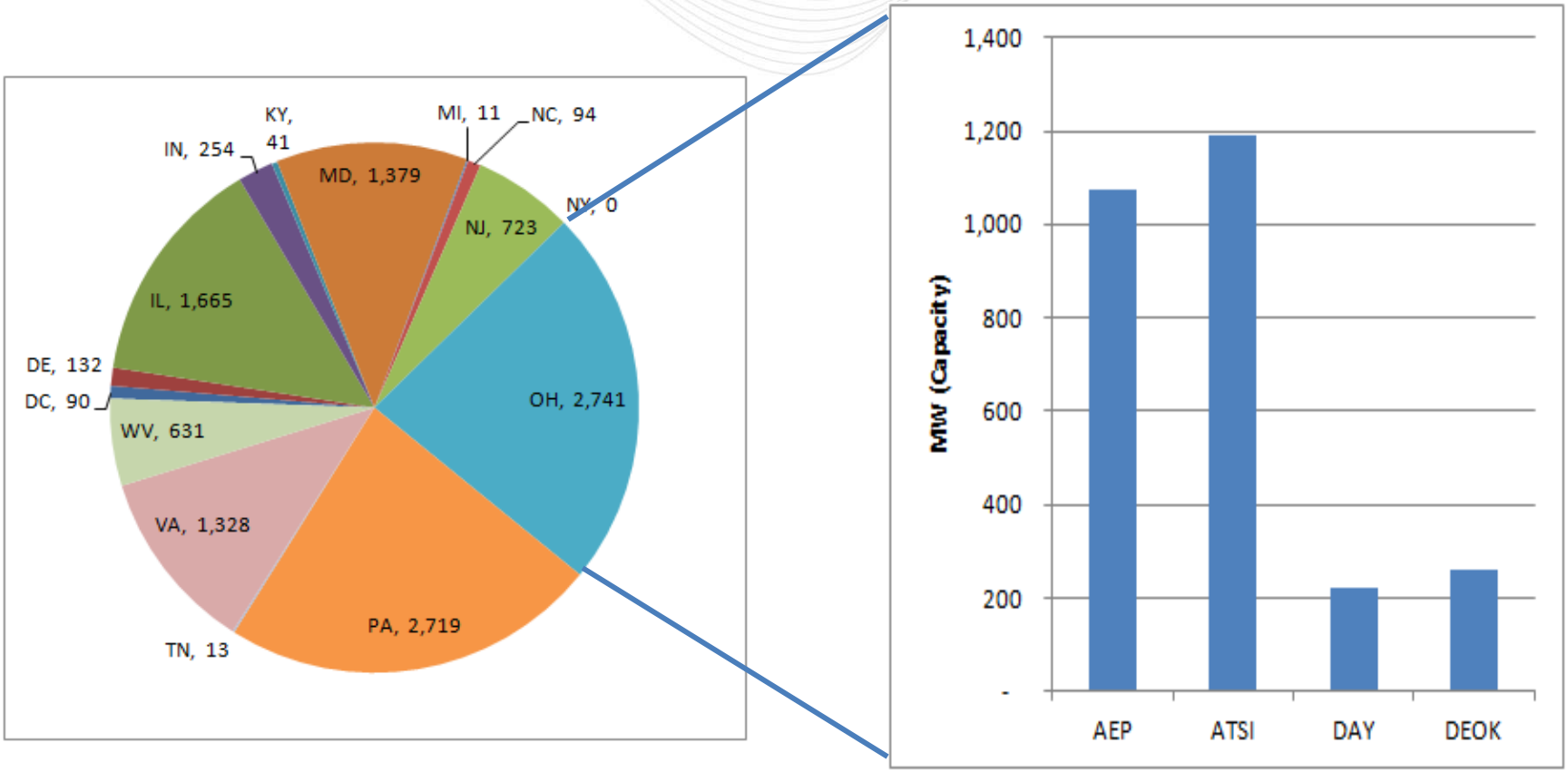
Emergency (capacity) DR in PJM today



Ohio ~1,800 Commercial and Industrial customers

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Emergency DR Revenue and Penalities

- Revenue
  - Capacity volume bid in market can not exceed capacity responsibility for the customer
    - Peak Load Contribution ("PLC")
  - RPM clearing price * Capacity volume
    - $6,000 - $46,000 per year for 1 MW in Ohio (based on prior auctions)
  - Energy paid at higher of LMP or offer price
- Penalties
  - Resource Capability Deficiency
    - Annual Revenue + Higher of (20% * Revenue OR $20/MW-day)
  - Event Compliance
    - On Peak: Lesser of (1/number of events or 50%) * Annual Revenue
    - Off Peak: 1/52 * Annual Revenue

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Emergency Product Type Requirements

Requirement	Limited DR	Extended Summer DR	Annual DR
Availability	Any weekday, other than NERC holidays, during June – Sept. period of DY	Any day during June-October period and following May of DY	Any day during DY (unless on an approved maintenance outage during Oct. - April)
Maximum Number of Interruptions	10 interruptions	Unlimited	Unlimited
Hours of Day Required to Respond *(Hours in EPT)*	12:00 PM – 8:00 PM	10:00 AM – 10:00 PM	Jun – Oct. and following May: 10 AM – 10 PM Nov. – April: 6 AM- 9 PM
Maximum Duration of Interruption	6 Hours	10 Hours	10 Hours
Notification	Must be able to reduce load within 2 hours of notification		
Event Compliance	Data due 45 day after end of event month		
Test Compliance	Mandatory test required if no emergency event called		

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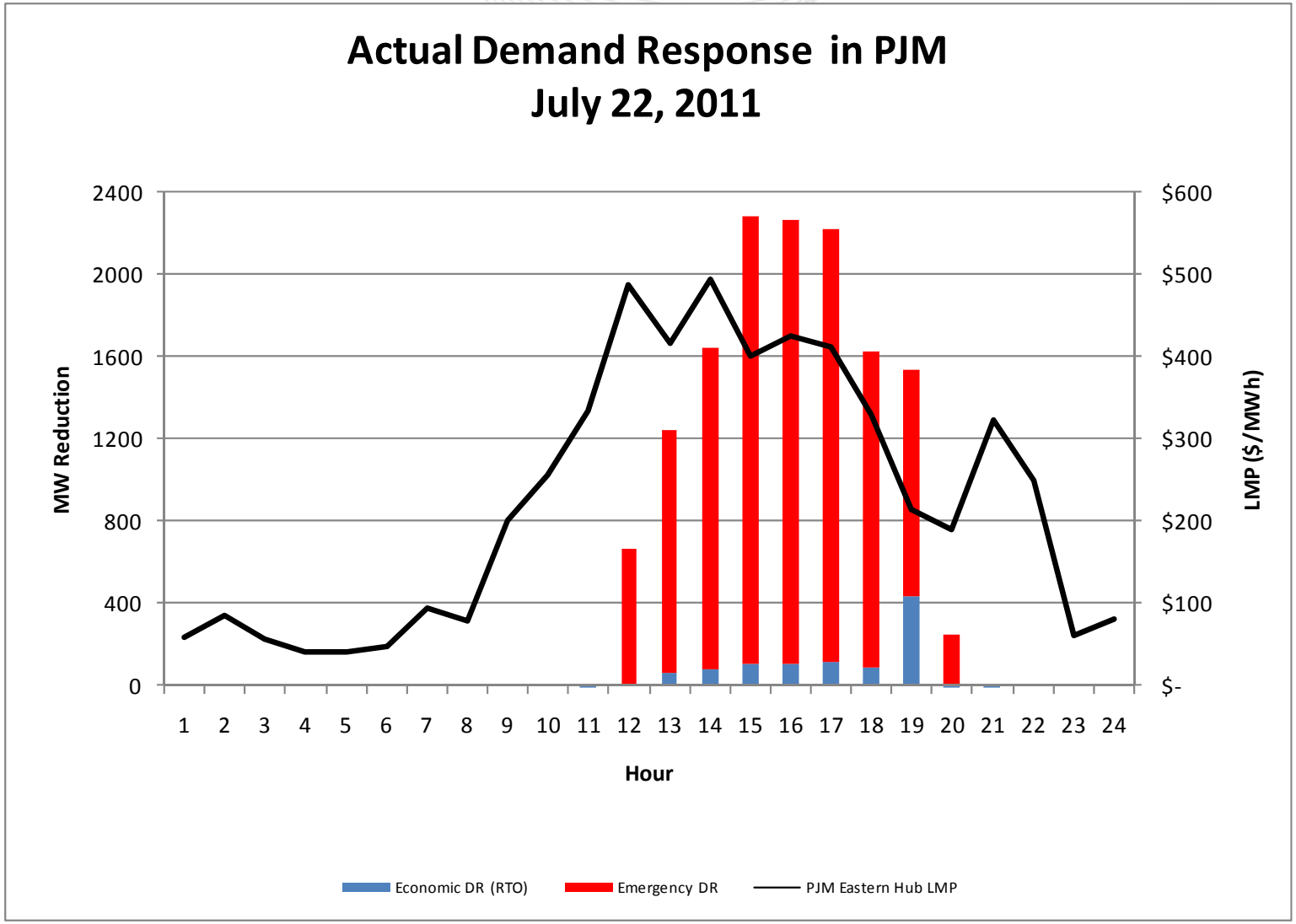
Actual Demand Response in PJM
July 22, 2011
MW Reduction
LMP ($/MWh)
Hour
2400
2000
1600
1200
800
400
0
$600
$500
$400
$300
$200
$100
$-
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Economic DR (RTO)
Emergency DR
PJM Eastern Hub LMP

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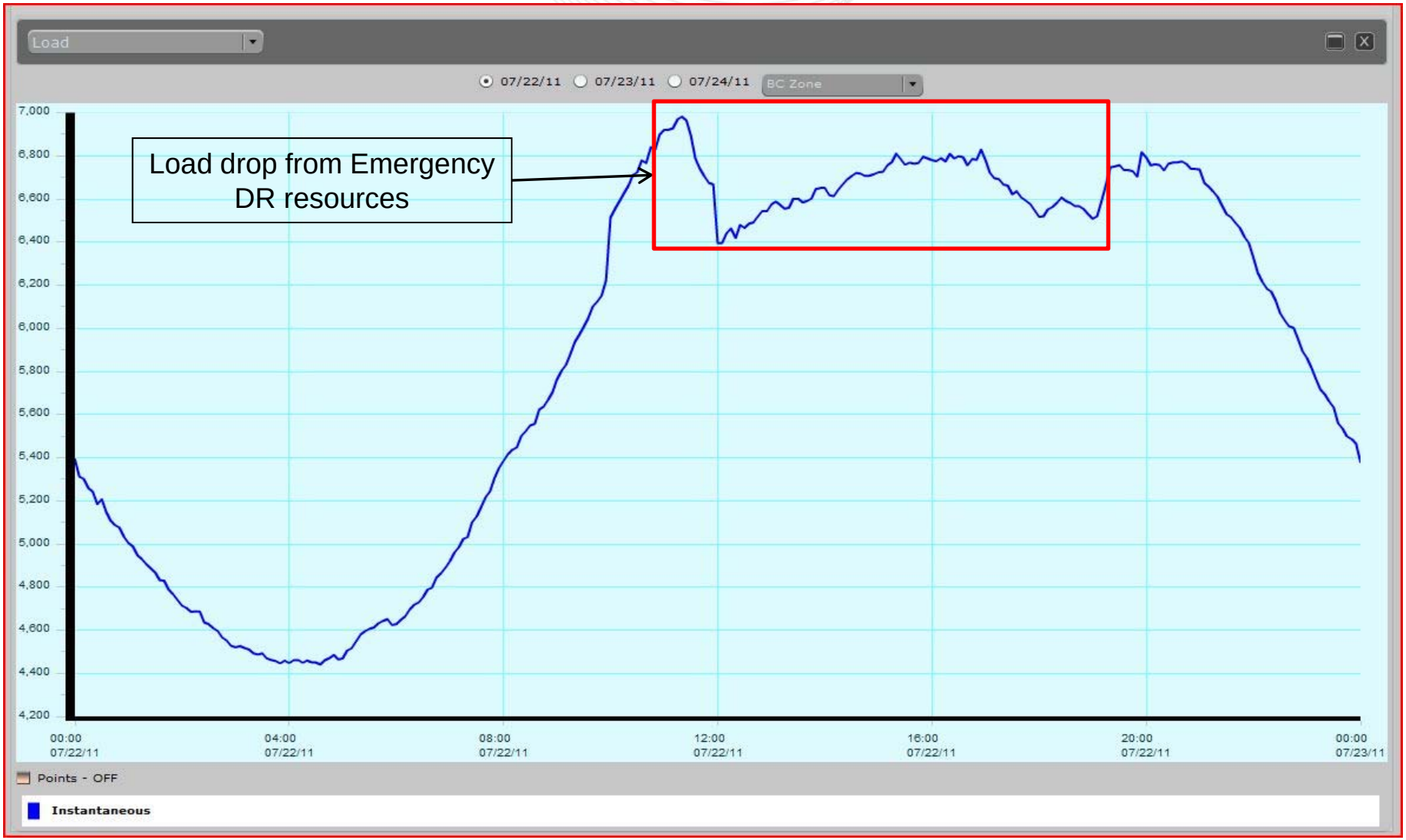
BGE Load during 7/22/11 Emergency event



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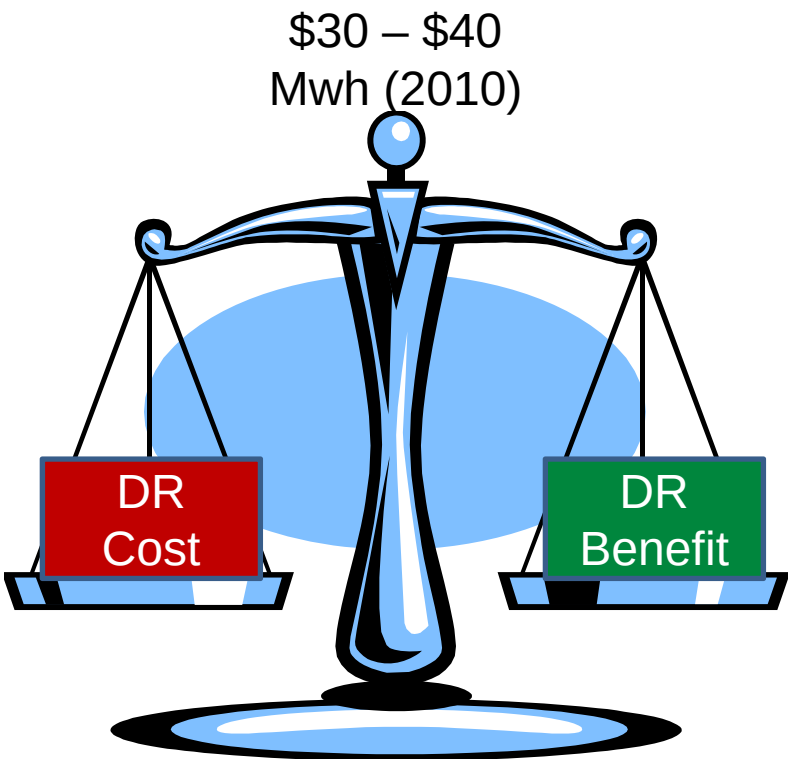
Economic DR in Energy market
Post Order 745 (4/1/12)

- Participation
  - Day Ahead market or dispatched by PJM
  - Accurate load estimation methodology
- Revenue
  - If bid => Net Benefits Test
    - Higher of Load reduction * LMP or bid value
  - If bid < Net Benefits Test
    - Load reduction * LMP minus retail rate for generation and transmission



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Demand Response in Ancillary Service Markets

- Day ahead scheduling reserves (30 minute supplemental reserves)
  - Must reduce net load within 30 minutes if dispatched by PJM
  - Hourly market price (DAMCP)
    - Jan – Sept 2011 average ($1.04 mwh)
  - Minimal participation to date based on economics
- Synchronized Reserves (10 minute spinning reserves)
  - Reduce load during reserve shortage, must reduce net load within 10 minutes.
  - Hourly market price (SRMCP)
    - Jan – Sept 2011 average (Mid Atlantic = $12.00 mwh, RFC non-Mid Atlantic = $0.05 mwh)
  - Active participation from ~120 different resources
- Regulation – real time load change (increase and decrease) based on real time system conditions
  - Hourly market price (RMCP)
    - Jan – Sept 2011 average ($17.03 mwh)
  - 2 resources began participation in December 2012

0.1 MW required to participate

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DR next steps

- Price Responsive Demand ("PRD")
- Order 745 (energy market compensation)
- DR Capacity market measurement and verification changes
- DR regulation market enhancements

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