Overview of Demand Response
PJM
Growth, Statistics, and Current Footprint

Integrations completed as of May 1st, 2005

Current PJM RTO Statistics

- Generating Units: 1,200 +
- Generation Capacity: 165,000 MW
- Peak Load: 144,644 MW
- Transmission Miles: 56,070
- Area (Square Miles): 164,250
- Members: 500 +
- Population Served: 51 Million
- Area Served: 13 States and DC
How is PJM Different Than My Local Utility?

- PJM does not own any transmission or generation assets
- PJM does not take ownership of the energy on the system
- PJM is not responsible for the actual maintenance on generators or transmission systems (PJM coordinates maintenance)
- PJM does not directly serve any end use (retail) customers
How is PJM Different Than My Local Utility?

- PJM maintains the “big picture” of the transmission system regardless of ownership
- PJM by agreement has operational control of the transmission system
- PJM is operated as “profit neutral”
- PJM is not a publicly traded company
- PJM remains totally independent of all PJM members
PJM’s Operational Markets

- Day-Ahead Energy Market
- Real-Time Energy Market
- Reliability Pricing Model
  - Capacity construct effective June 2007
- Financial Transmission Rights
  - Auction Options
- Ancillary Services Markets
  - Regulation Market
  - Synchronized Reserve Market
  - Day Ahead Scheduling Reserve Market
  - Black Start Services
  - Reactive Services

Price in US$
PJM

Demand Side Response
Responding to Wholesale Prices

Will End Use Customer reduce consumption when wholesale prices are high?

Wholesale Price (Hourly LMP)

Retail Rate

Will End Use Customer reduce consumption when wholesale prices are high?
EMERGENCY

Designed to provide a method by which end-use customers may be compensated by PJM for reducing load during an emergency event.

ECONOMIC

Designed to provide an incentive to customers or curtailment service providers to reduce consumption when PJM LMP prices are high.

Demand Side Response (DSR) = Load Response
## Participation Growth – Economic

<table>
<thead>
<tr>
<th>Year</th>
<th>Total MWh</th>
<th>Total Payments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>6,727</td>
<td>$801,119</td>
</tr>
<tr>
<td>2003</td>
<td>19,518</td>
<td>$833,530</td>
</tr>
<tr>
<td>2004</td>
<td>58,352</td>
<td>$1,917,202</td>
</tr>
<tr>
<td>2005</td>
<td>113,393</td>
<td>$12,000,354</td>
</tr>
<tr>
<td>2006</td>
<td>217,056</td>
<td>$16,118,042</td>
</tr>
<tr>
<td>2007</td>
<td>608,745</td>
<td>$45,173,237</td>
</tr>
</tbody>
</table>
Participation Growth – Emergency (Capacity)

Prior to RPM Implementation

RPM Implemented

Delivery Year

M

0 1000 2000 3000 4000 5000 6000


ALM RPM, ILR RPM, DR
## Load Response in PJM

<table>
<thead>
<tr>
<th><strong>Energy</strong></th>
<th><strong>Capacity</strong></th>
<th><strong>Ancillary Services</strong></th>
</tr>
</thead>
</table>
| • Economic  
• Emergency – Energy Only  

Voluntary load reductions for energy, even during a PJM emergency event | • Emergency – Capacity Only  
• Emergency – Full (also gets an energy payment)  

**Mandatory** reduction for PJM Load Management emergency event | • Synchronous Reserves  
• Regulation  
• DA Scheduling Reserves  

Load bids into these markets and responds to an event exactly like a generator  

**Mandatory** response to a Synchronous Reserve event if cleared in market |
Roles of PJM Market Participants

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

**Generator:**
PJM Member that owns, or leases, facilities for generation of electric energy that are located within the PJM Control Areas.

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

**Electric Distribution Company:**
PJM Member that owns, or leases, electric distribution facilities that are used to provide distribution service to electric load within the PJM Control Areas.
### Options to Participate

#### EMERGENCY

**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

#### ECONOMIC**

**Day Ahead Market**
- CSP Submit Day Ahead Bid in eMKT
- PJM Notifies CSP via eMKT
- Obligated 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**
Payment to Load Reducers

**EMERGENCY**

PJM pays Zonal LMP
- Resource is made whole to its offer value, which includes:
  - Minimum dispatch price
  - Minimum down time
  - Shutdown costs

- Full Emergency participants also receive capacity value
- Emergency – Capacity Only participants receive capacity value only

**ECONOMIC**

PJM pays Zonal LMP – Retail Rate
Retail Rate = Generation + Transmission portion of the LSE retail charges (G & T)

- Incentives for the Economic Program expired December 31st, 2007

**Except Real Time LMP Based Customer**
# LMP Based Customers

<table>
<thead>
<tr>
<th>Economic Program</th>
<th>Day Ahead LMP Based Customers</th>
<th>Real Time LMP Based Customers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>May Participate</strong></td>
<td><strong>May Participate</strong></td>
</tr>
<tr>
<td>Participation Options</td>
<td>• Real Time or Day Ahead</td>
<td>• Real Time Market Only</td>
</tr>
</tbody>
</table>
| Operations       | • Clear in the Day Ahead Market  
|                  | • Self-Schedule a Load Reduction in Real Time Market | • Dispatched by PJM in Real Time Market |
|                  | • Dispatched by PJM in Real Time Market |                          |
| Compensation     | • As defined by the program | PJM shall pay such end-use customer the difference between the actual savings achieved based on zonal LMP and the total value of the end-use customer’s load response bid, if savings achieved by the end-use customer are less than the total value of the load response bid. |
*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.
References
Load Response Business Rules Link:
How do I get access to RT Wholesale Prices?

Click on eData (Guest) from the PJM Homepage (PJM.com)
Where can I find a CSP?

Below is a listing of curtailment service providers (CSPs) who participate in the PJM load response program. The list is broken down by all, multiple, and single states within the PJM footprint.

For more information on the territory served by PJM, please visit our maps. If you are a CSP and wish to supply your company’s contact information, complete the enrollment/change form.

**CSPs Who Participate in ALL States within the PJM Footprint**

<table>
<thead>
<tr>
<th>Company</th>
<th>Contact</th>
<th>Active Zone(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>American PowerNet</td>
<td>David Butler</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>Phone: 610-372-8500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E-mail: David Butler</td>
<td></td>
</tr>
<tr>
<td>Baltimore Gas &amp;</td>
<td>David E. Greenberg</td>
<td>All</td>
</tr>
<tr>
<td>Electric</td>
<td>Phone: 410-234-5216</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Email: David E. Greenberg</td>
<td></td>
</tr>
</tbody>
</table>
Demand Response Steering Committee

PJM Committee with stakeholder input:
• sets policy direction for DSR in PJM
• handles broad strategic initiatives that addresses barriers to entry, regulatory policy, education protocols, etc.

PJM Committees

PJM committees - an integral part of the PJM model - actively work to refine and improve PJM’s rules, policies and processes. They are a dynamic forum for members/customers. Collectively, they facilitate PJM’s ability to move forward with positive change.

The Members Committee (MC) reviews and decides upon all major changes and initiatives proposed by committees and user groups.

The Markets and Reliability Committee (MRC) is responsible for ensuring the continuing viability and fairness of the PJM markets. The MRC also is responsible for ensuring reliable operation and planning of the PJM system.

The Demand Response Steering Committee (DRSC) is responsible for setting policy direction for other committees and working groups aimed at promoting effective demand response market participation through development of clear and consistent market rules. This Committee reports to the Markets and Reliability Committee.
References

• **PJM Web**
  – [www.pjm.com](http://www.pjm.com) (PJM Homepage)

• **PJM Member Relations:**
  – [http://www.pjm.com/about/contact/form-contact.html](http://www.pjm.com/about/contact/form-contact.html)
  – 610-666-8980
  – 866-400-8980