PJM Capacity Market
Evolution of Supply

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21% of U.S. GDP produced in PJM

KEY STATISTICS

- Member companies: 900+
- Millions of people served: 61
- Peak load in megawatts: 165,492
- MWs of generating capacity: 183,604
- Miles of transmission lines: 62,556
- 2012 GWh of annual energy: 793,679
- Generation sources: 1,376
- Square miles of territory: 243,417
- States served: 13 + DC

As of 6/1/2013
Foundation for Forward Capacity Market

RPM

- Auction Structure
- Market Power Mitigation
- Performance Requirements

Resource Adequacy Requirement  Locational Constraints  Forward Procurement
Transformational Supply Evolution

Cleared Installed Capacity

- Coal
- Gas
- Nuclear
- Wind & Solar
- Demand Response

* Nameplate
Transitioning from Coal to Gas

2009 to Date: 28,000 MW in Retirement Notices
RPM has achieved resource adequacy
  - RPM has attracted and retained sufficient capacity to meet or exceed reliability requirements

Prices have been consistent with market conditions
  - Lower prices (below Net CONE) under excess supply conditions
  - Higher prices under tighter supply conditions, but still below Net CONE in recent auctions

RPM has reduced costs by fostering competition
  - Generally level playing field has reduced costs by attracting investments in low-cost supplies from demand response, efficiency and uprates

RPM has enabled cost-effective response to environmental rules
  - Facilitated economically efficient tradeoffs among investment in environmental retrofits, retirement and replacement with lower-cost alternative supplies
PJM Forward Capacity Market, 2007-2015

Cumulative Generator Capacity Additions

Demand Resource Additions

- Energy Efficiency
- Demand Response
- Committed/Cleared DR
### Evolution of Supply
- Traditional resources: **Less flexible**
- Renewable resources: **Intermittent**
- Less capability to provide power grid services

### Evolution of Demand
- Technology enabled flexibility
- Alternative resource growth
- Enhanced capability to provide grid services

### Market Evolution
- Improvement in optimization and control systems
- More real-time markets to reward consumer flexibility
- Development of Forward Demand Response Control Signals
Evolution of Demand

• Trends
  – Increase in customer commitment to curtail demand or provide grid services during high price periods
  – Smart Grid Technology deployment
  – Retail rate innovation

• Operational Implications
  – Increase in customer response to price
  – Aggregated demand resources providing high quality grid services
  – In PJM, 9% of synchronized reserve is DR-based
Laurel Mountain
Wind Farm
98 MW
61 turbines
Battery Storage
Lithium-ion (A123)
Power 32 MW, Energy 8 MWh
Aggregated Demand Resource Response to Synchronized Reserve Event

Aggregation 13,078 Residential Customers

Wireless Integrated Control Platform

Curtailed Load Event graph