PJM Overview: PJM Structure and Cross-Border Examples
PJMJ as Part of the Eastern Interconnection

**KEY STATISTICS**

- PJM member companies: 614
- Millions of people served: 51
- Peak load in megawatts: 144,644
- MWs of generating capacity: 167,326
- Miles of transmission lines: 56,500
- GWh of annual energy: 682,000
- Generation sources: 1,325
- Square miles of territory: 168,500
- Area served: 13 states + DC
- Internal/external tie lines: 247

- 26% of generation in Eastern Interconnection
- 23% of load in Eastern Interconnection
- 19% of transmission assets in Eastern Interconnection
- 19% of U.S. GDP produced in PJM
Nine Major North American RTOs / ISOs
PJM in the World

- United States, 1,010, 22%
  (PJM, 180, 4%)
- China, 797, 17%
- Japan, 281, 6%
- Central & South America, 241, 5%
- Russia, 224, 5%
- India, 177, 4%
- Middle East, 165, 4%
- Ukraine, 54, 1%
- Mexico, 57, 1%
- Korea, South, 80, 2%
- United Kingdom, 86, 2%
- Spain, 94, 2%
- Italy, 99, 2%
- Brazil, 104, 2%
- France, 118, 3%
- Africa, 123, 3%
- Canada, 128, 3%
- Germany, 139, 3%
- Korea, South, 80, 2%
- Other, 649, 14%

2010 CIA World Factbook
What is PJM?

Operators of a Stock Exchange for Energy...

Air Traffic Controllers for the Transmission Grid....

Match Generation to Load

SIMULTANEOUSLY!

RELIABLY!
• Operate the bulk electric power grid for reliability

• Facilitate various electric markets

• Plan for transmission expansion

• Monitor the markets to ensure competitiveness

• Provide exceptional customer/member service

• Share best practices with neighboring and international system operators
How is PJM Different From My Local Utility?

PJM does:

• Maintain the “big picture” of the transmission system regardless of ownership.
• Have, by agreement, operational control of the transmission system.
• Operate as “profit neutral.”
• Remain totally independent of all PJM members.
• Coordinates maintenance of generation and transmission systems.
How is PJM Different From My Local Utility?

PJM does not:

• Own any transmission or generation assets.
• Function as a publicly traded company.
• Take ownership of the energy on the system.
• Perform the actual maintenance on generators or transmission systems.
• Serve, directly, any end use (retail) customers.
TO = Transmission Owner
GEN = Generator
IPP = Independent Power Producer
Governance
PJM Authority Provided by Contract

- Regional Transmission Provider
- Regional Control Area Operator
- Market Developer and Coordinator
- Regional Transmission Planner

- NERC Security Coordinator
Independent Board

Members Committee

- Generation Owners
- Transmission Owners
- Other Suppliers
- Electric Distributors
- End-Use Customers
Overview of PJM Electricity Markets
Load Serving Entities obtain energy to serve customers.

Self-schedule own resources

Bilateral Transactions

PJM Spot Market

Industrial

Residential

Commercial
PJM’s Operational Markets and Services

- Two Energy Markets
  - Day-Ahead
  - Real-Time
- Reliability Pricing Model (RPM) Auction
- Financial Transmission Rights (FTRs) Auction
- Ancillary Services
  - Regulation Market
  - Synchronized Reserve Market
  - Blackstart Service
  - Reactive Services
Overall Market Timeline

- **Long Term** (Up to 4 years ahead)
  - Bilateral forward contracts / Over the counter
  - Transmission reservations
    - ARR allocations
    - Annual FTR auctions
    - FTR Secondary Market
    - Monthly FTR auctions
  - Generation Capacity Market

- **Week Ahead** (Month Ahead)
  - Day-Ahead Market
  - Reliability analysis
  - Unit commitment
  - Outage analysis
  - Load forecast
  - Forward reliability analysis

- **Day Ahead**
  - Near-term reliability analysis
  - Real-Time Market
  - Unit Dispatch System
  - Ancillary Service Markets

- **Real Time (operating day)** (Hours Ahead, Minutes Ahead)
Regional Market Benefits

Reliability – resolving constraints and economic efficiency— from $470 million to $490 million in annual savings

Generation investment – decreased need for infrastructure investment – from $640 million to $1.2 billion in annual savings

Energy production cost – efficiency of centralized dispatch over a large region – from $340 million to $445 million in annual savings

Grid services – cost-effective procurement of synchronized reserve, regulation – from $134 million to $194 million in annual savings

$2.2 billion in annual savings
• PJM invites resource-specific sell offers for planning each year, three years in advance.
• Products that may be offered include: existing and planned generation; planned transmission upgrades; and existing and planned demand resources
• New generation, new demand response alternatives, and new transmission solutions can compete directly with existing resources
Transmission Planning
• Holistic Integrated Regional Planning Process
  – Integrate all needs and all solutions
  – Involve stakeholders
  – Stay focused on the states

• Fully Integrated Planning, Markets and Operations

• Infrastructure Management as an Integrated System – Single Entity Decision-Making
  – Well defined cost allocation / cost recovery
  – Perform risk assessments
  – Develop an aging infrastructure strategy
PJM Cross-Border Coordination

• Inter-regional
• International
Joint Operating Agreement: PJM and Midwest ISO

• Congestion Management: Coordination of Flowgates
• Exchange of Operating Data: Real time generator data, planning data, facilities data
• Flow data, reliability data, interchange schedules
• Consistency of modeling for ATC, congestion management, outage scheduling
• Planning: Requirement of Cross-Border Benefits
  – Benefit/Cost Ratio of 1.25
• Coordination of Reliability Planning
• Economic Planning: identifying Market Efficiency Projects
• Joint Operating Agreement Link:
  – http://www.pjm.com/~/media/documents/agreements/joa-complete.ashx
Basic Cross-Border Tools:

• Redispatch of generation when cost effective to solve constraint across the border;
• Respecting and modeling each entity’s AFC determinations;
• Outage schedule: Joint Approvals
• Emergency coordination
• Planning and cost allocation of cross-border facilities: 1.25 benefit to cost ratio
LET’S TALK…

Craig Glazer
Vice President-Federal Government Policy
PJM Interconnection
Washington, D.C., USA
1-202-393-7756
GLAZEC@PJM.COM