A Review of Market Monitoring Activities at U.S. Independent System Operators

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Approach

- Focused on four operating ISOs
  - CAISO, ISO-NE, NYISO, and PJM
- Conducted Interviews
  - ISO market monitoring staff
  - External Market monitors (e.g., CAISO MSC)
  - State PUC and FERC OMOI staff
- Review documents on Market Monitoring
  - ISO Market Monitoring plans; Annual Reports
  - Regulatory proceedings

Approach (cont)

- Synthesize information on market monitoring experience in wholesale electricity markets
  - Purpose of market monitoring
  - Structure of the MMU within ISO
  - Data they are authorized to collect
  - Metrics used and their purpose
  - Process of monitoring
  - Scope of authority
  - Reporting responsibilities
  - Impact of market monitoring: Case Studies

Power System Technical Requirements

- Sufficient Capacity to meet load
- A reliable network to deliver energy
- Reserve energy supply for contingencies
- Consideration for future needs

These needs can be handled by geographically distinct, regulated franchises, or by competitive market-based mechanisms. The former requires a central controller, the latter, an independent operator.

Comparison of Market Design Elements

Table 1. Markets Operated by the ISOs – as of October 2003				
	PJM	**NYISO**	**ISO-NE**	**CAISO**
Day-Ahead Energy Market	Yes	Yes	Yes	No
Real-Time Energy Market	Yes	Yes	Yes	Yes
Capacity	Yes	Yes	Yes	No
Regulation	Yes	Yes	Yes	Yes
Reserves	Yes	Yes	Yes	Yes
Financial Transmission Rights	Yes	Yes	Yes	Yes

Capacity is required to be available in CA

FTRs serve a function that is not in traditional vertically integrated utilities.

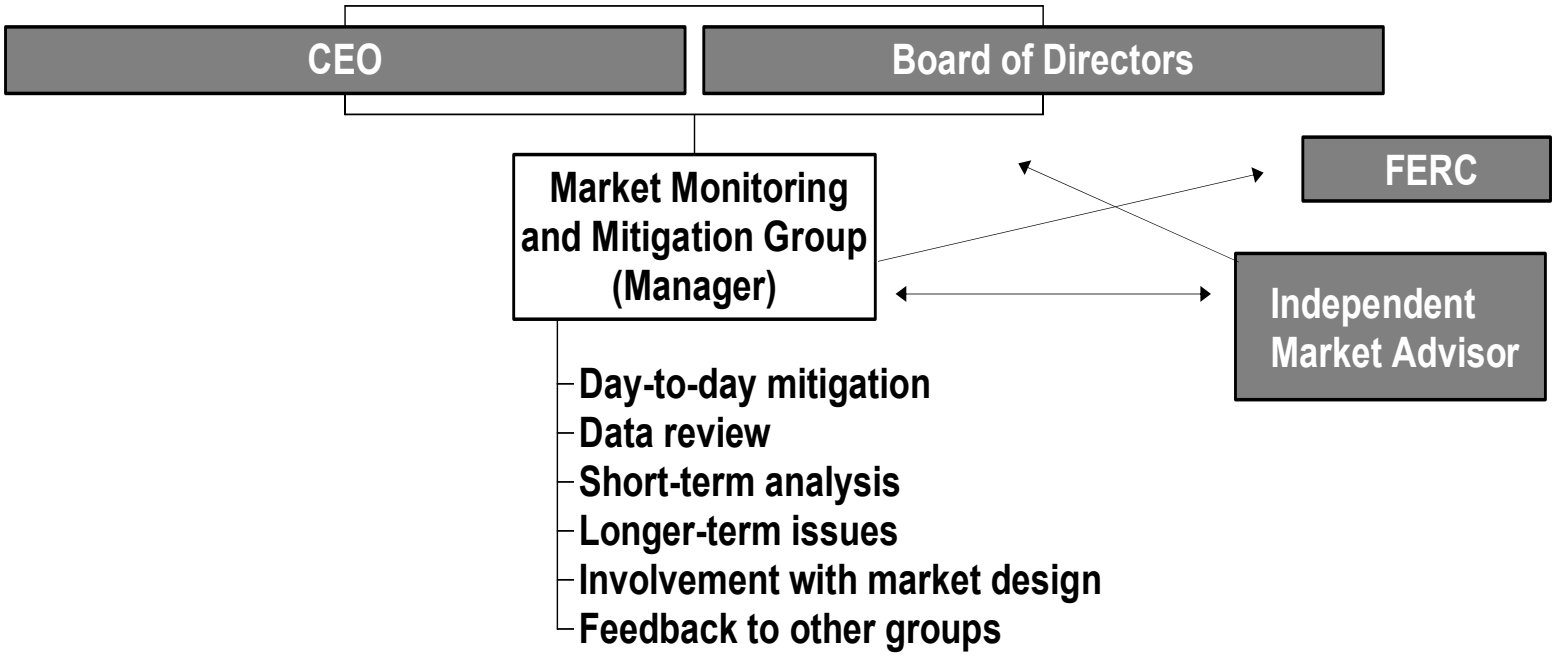
ISOs have similar markets, but differ in implementation.

Purpose of Market Monitoring

- Evaluate and report on market performance
- Propose changes to rules to improve market operation and performance
- Monitor compliance with the rules and apply mitigating measures and sanctions when applicable and authorized

Market Monitoring Staff				
	PJM	**NYISO**	**ISO-NE**	**CAISO**
Full Time Employees	12	31.5	11	14

Organization of Market Monitoring: ISO-New England



Daily Monitoring: Data and Metrics

Grid Statistics	Load
	Available capacity
	Congestion and binding constraints
	Deviations from scheduled dispatch
	Resource outages
	Must-Run unit operation

Competition	Concentration Measures
	Price-Cost Markup
	Congestion Costs
	Residual Supplier Index

Market Statistics	Prices
	Market Volume
	Congestion Costs
	Supply Curves
	Marginal Units

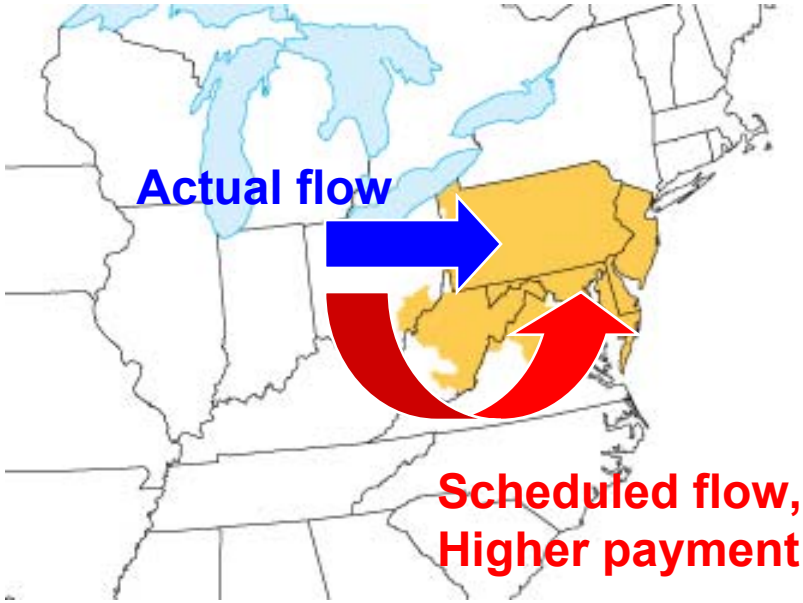
Market Power	The frequency a participant sets the clearing price
	Correlations between prices and offers in different markets
	Correlations between prices and bidding to operating conditions (outages, congestion, load)

Impact of Market Monitoring: Case Studies

- PJM Interface pricing: Demonstrates technical knowledge, and regulatory savvy to quickly eliminate the problem
- PJM Capacity Market: Shows process of implementing a rule change through ISO and FERC
- CAISO RMR Unit Outages: Investigation that led to FERC action
- CAISO MSC DCBC opinions: Demonstrates effectiveness & independence of external monitor

Market Monitoring Impact: PJM Interface Pricing (1)

- During summer of 2002, scheduled and actual deliveries diverged.
- Prior to July 19, 2002 payments based on scheduled flows.

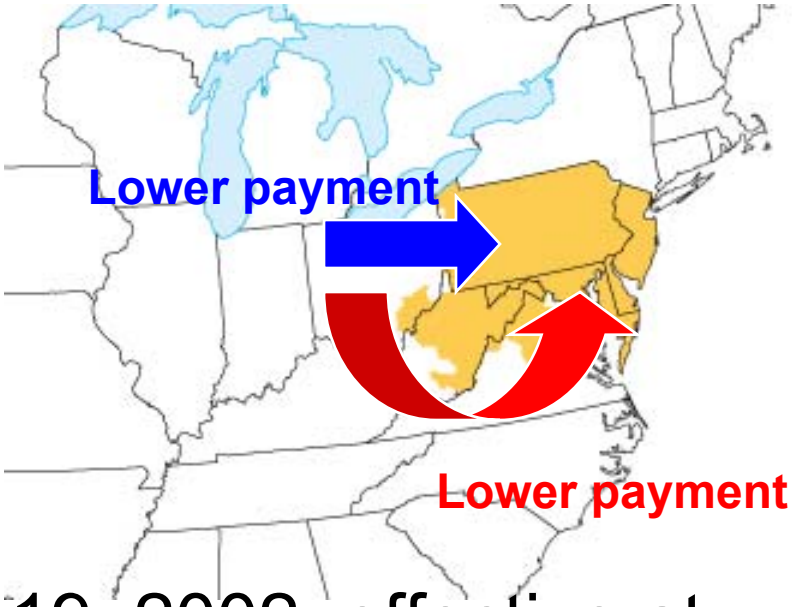


• Deliveries scheduled at the Southern Interface were delivered at the Western Interface.

• The Southern Interface had higher prices than Western Interface.

Market Monitoring Impact: PJM Interface Pricing (2)

PJM Solution: change payment policy so that deliveries originating to the west are paid the western interface price regardless of schedule.



- Policy announced 2pm July 19, 2002; effective at 3pm same day
- No rule change was required; PJM simply chose a more appropriate flow analysis

Longer Term Analysis and Metrics

- Averaged of frequency quantities
  - Monthly/Yearly Average Energy Price
  - Percent of time RSI <1.1
- Special Long term Metrics
  - 12-month competitive index
  - Revenue Adequacy for New Generation

Revenue Adequacy for New Generation

	Revenue Adequacy $/kW-yr	Comparison $/kW-yr	Assumptions
CAISO	72 - 77	70 - 100	Typical 500 MW Combined Cycle
PJM	72	63 - 74	$30/MWh marginal cost
NYISO	32 - 40	80	10,000 btu/kWh heat rate gas turbine, (outside NYC)
NYISO	130 - 150	180	10,000 btu/kWh heat rate gas turbine (NYC)

Corrective Actions to Encourage Compliance and Mitigate Market Power

- ISO authority is derived from FERC
- Market monitor's "toolbox"
  - Informal discussions with market participant(s)
  - Formal request for participants(s) to change behavior
  - Internal ISO dispute resolution procedures when appropriate
  - Modification of rules and procedures
  - Request FERC action
- Greatest Impact: Deterrence value

Market Power Mitigation Measures: Automatic Mitigation Procedures (AMP)

- Rationale: Quickly-applied mitigation procedures can stem noncompetitive behavior and limit impacts of exercise of market power.
- ISO looks at bids and applies AMP in multiple steps:
  1. Conduct Test – offers are below some reference price threshold.
  2. Impact Test – impact of bid that fails the conduct test on market prices
  3. ISO may replace bid(s) with the reference (default) offer

Getting AMPed: What matters?

- Scope – which market(s) (day-ahead and/or real-time)?
- Determining Reference Price Level
  - 90 day average (lower of mean or median) during "competitive periods" adjusted for fuel prices (NYISO, ISO-NE)
  - What if not enough info available? Mean of lower 25% of LMP for past 90 days
- Conduct Level Trigger
  - $25 increase or 50% (ISO-NE) vs. Lower of $100 or 300% (NYISO) above Ref. Price

Key Issues: "Independence of MMU"

- What are major actions to ensure "independence" of Market Monitoring?
  - From Mkt Participants
  - From ISO market & operations
- How should resource/funding needs be established for market monitors?
  - Benchmark approaches (e.g. staffing at other ISOs)
  - Bottoms-up budget (reviewed by RTO Board and/or FERC)
  - Account for distinctive features of proposed approach to Market Monitoring in West

Key Issue: Potential roles and value of External Market Advisors/Monitors

- Focus on longer-term issues related to market design & suggested market rules;
- Can conduct independent studies/investigations
- Three models observed:
  - Consultant (NYISO,ISO-NE)
  - Committee of experts (CAISO)
  - Internal MMU unit that hires consultants (PJM)
  - West-wide MME:
- West-wide MME:
  - Will it focus *primarily* on longer term market performance and design issues?

Key Issues: Access to ISO confidential market data by state agencies

- MMU at center of debate over access to market data
- NYISO:
  - Mkt Monitoring Plan prohibits MMU from disclosing Protected Information to any entity without consent
  - NYPSC staff have access based on NYPSC Order
- PJM: Prohibited from providing confidential Member data without Member permission BUT policy under review after FERC Technical Conference
- ISO-NE: Non-public meeting and quarterly report available to appropriate state agencies (subject to confidentiality protections of NEPOOL info policy)

Key Issues: Access to ISO confidential market data by state agencies?

- Defining “appropriate State agencies”
- Purpose and Specific Data requested
  - NYPSC: Look at Bids; Look at Bills
  - Avoid “fishing expeditions” but difficult to pre-specify data requirements for specific market problems/flaws
- Assess State PUC technical capabilities and staff resources
- Useful Information vs. massive amounts of undigested raw market data
- Philosophy:
  - Competitive wholesale markets will benefit from more or less transparency and increased availability of timely market data

Background Slides

AMP: Determining Appropriate Reference Price is Key

	CAISO	ISO-NE	NYISO	PJM
Reference Price Level	Presently determined by independent entity. In new market design it will be the mean of the lower 25% of LMPs over the past 90 days – adjusted for fuel cost. (separate values for off- and on-peak supply)	90 day average (lower of mean and median), during competitive periods, adjusted for fuel prices. If not enough information, mean of the lower 25% of LMPs for past 90 days, adjusted for fuel cost. Or, a cost-based estimate	90 day average (lower of mean and median), during competitive periods, adjusted for fuel prices. If not enough information,mean of the lower 25% of LBMPs for past 90 days, adjusted for fuel cost. Or, a cost-based estimate	Weighted average LMP for a specified period for which the resource was dispatched in merit order. Or, incremental costs plus ten percent.