



MONITORING, MEASURING and ASSURING the Competitiveness of the Energy Market The U.S. Experience

16 December 2008

Kim Wissman, Director

Energy & Environment Department,
PUCO

Executive Director, OPSB



US Energy Markets

➤ Independent Market Monitors

➤ FERC

➤ State Regulators



Independent Market Monitors

- Under the Independent Transmission Operator
- Generally monitor and report on markets at large and potential abuses
- Detect structural problems
- Identify unusual behavior
- Suggest modifications
- In some instance, impose penalties and mitigation strategies



State Regulatory Commissions

- Establish whether local markets are ready for competition
- Price caps and other customer protections in early years of development
- Identify structural problems and remedies



Federal Energy Regulatory Commission

Wholesale Markets

State Regulatory Commissions

Retail Markets



Is that OK?

- Vigilant oversight of energy markets, both wholesale and retail
- More than enough to do
- Different markets/players/scopes



Ohio Statute

- Ensure retail electric service consumers protection against unreasonable sales practices, market deficiencies and market power
- Retail electricity prices are strongly correlated to wholesale market prices
- Therefore, wholesale is of concern to the state commissions



Market Monitoring Electricity

- Retail Market
- Wholesale Market
- Corporate Separation
- Consumer Intelligence
- Demand Forecasting
- Supply Estimation
- Supplier Complaints

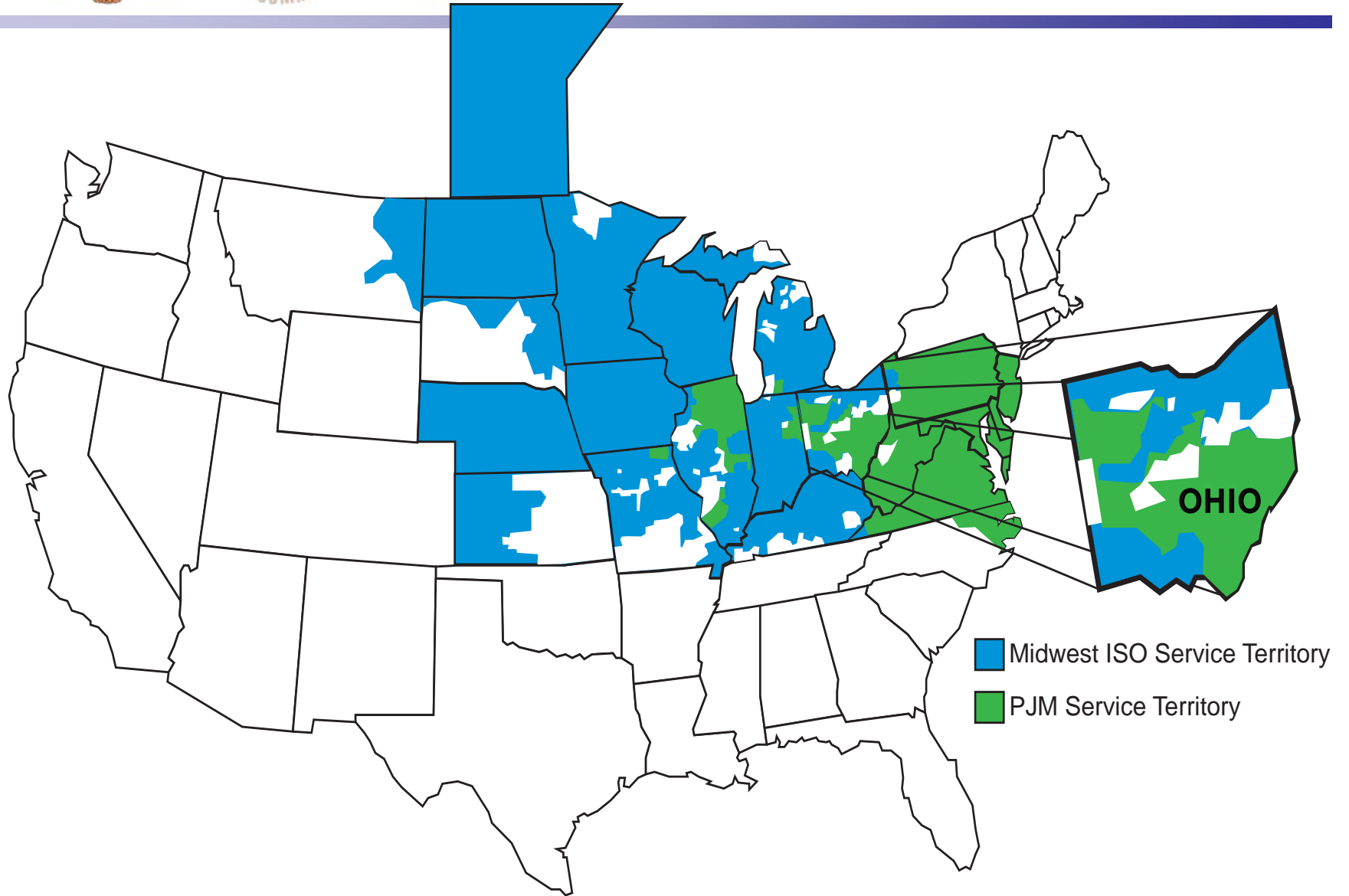


- Price stabilization/volatility
- Supply
- Behavior
- Service quality/reliability
- Investment in new infrastructure
- Innovative products
- Risk management

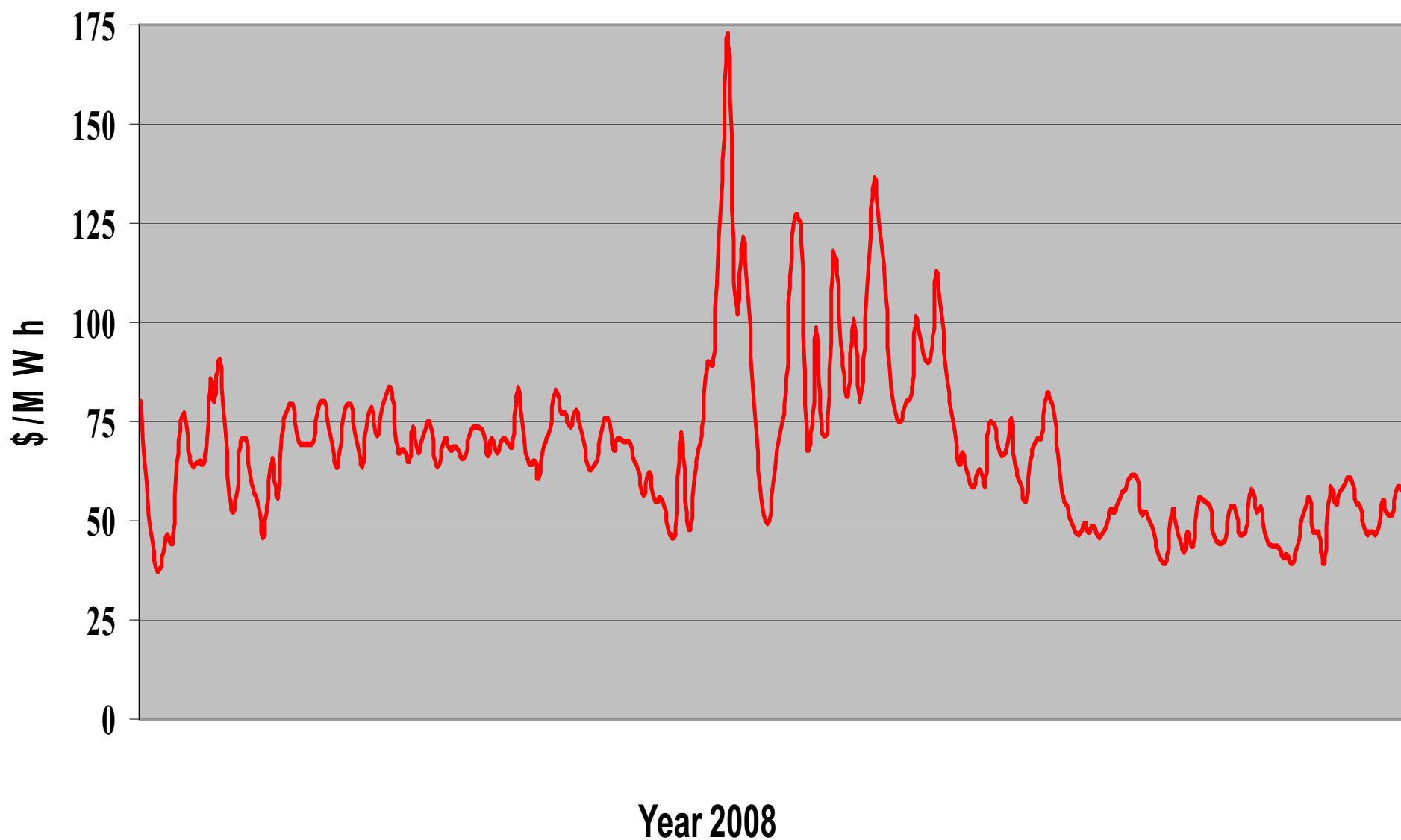


In fact, FERC and states should work together

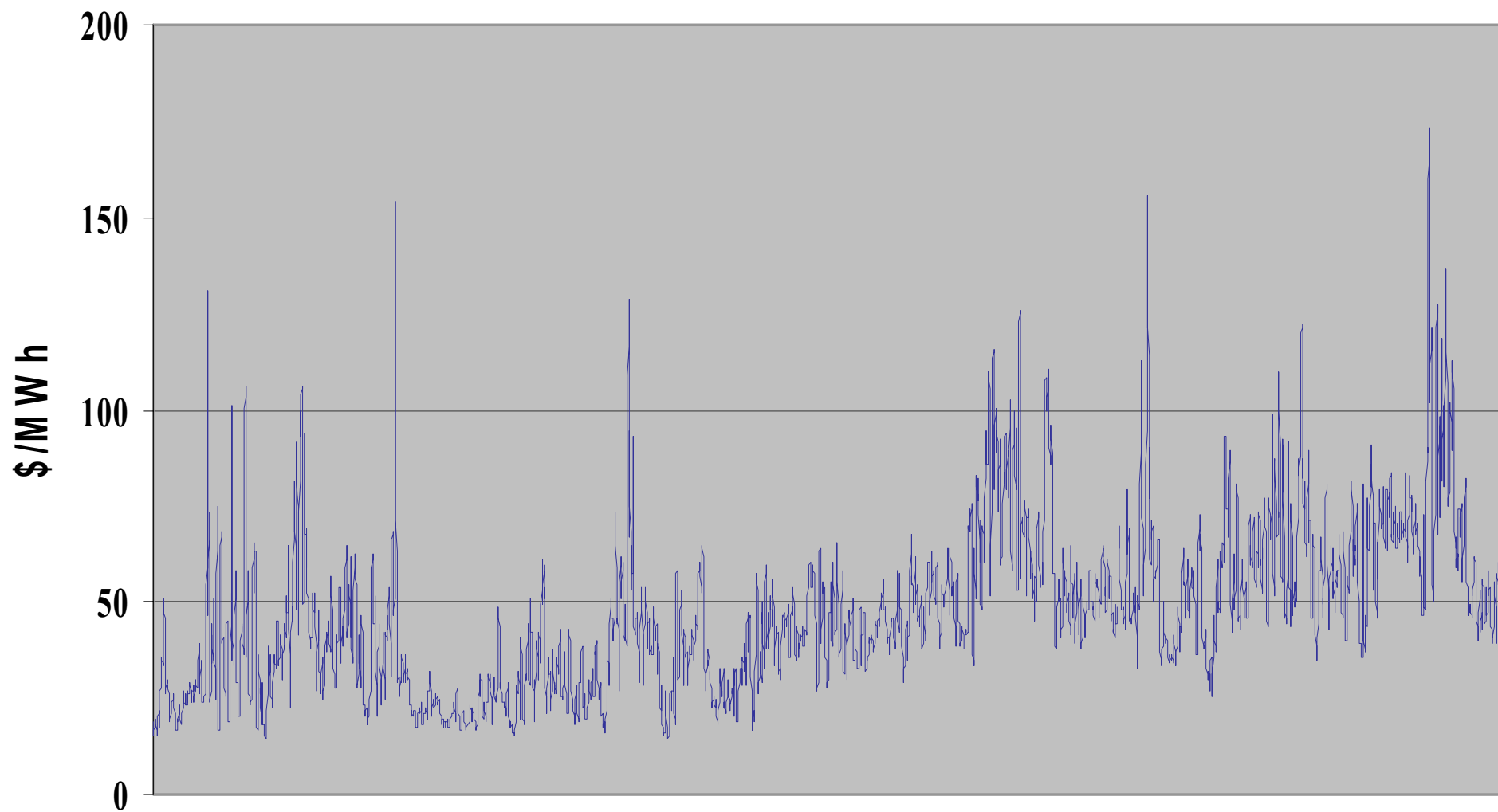
- wholesale flows to retail
- information sharing both ways
- behavior implications/market reactions
- unexplained price movements and market activity around extreme weather



Cinergy Daily Prices \$/MWh Jan-Dec 2008

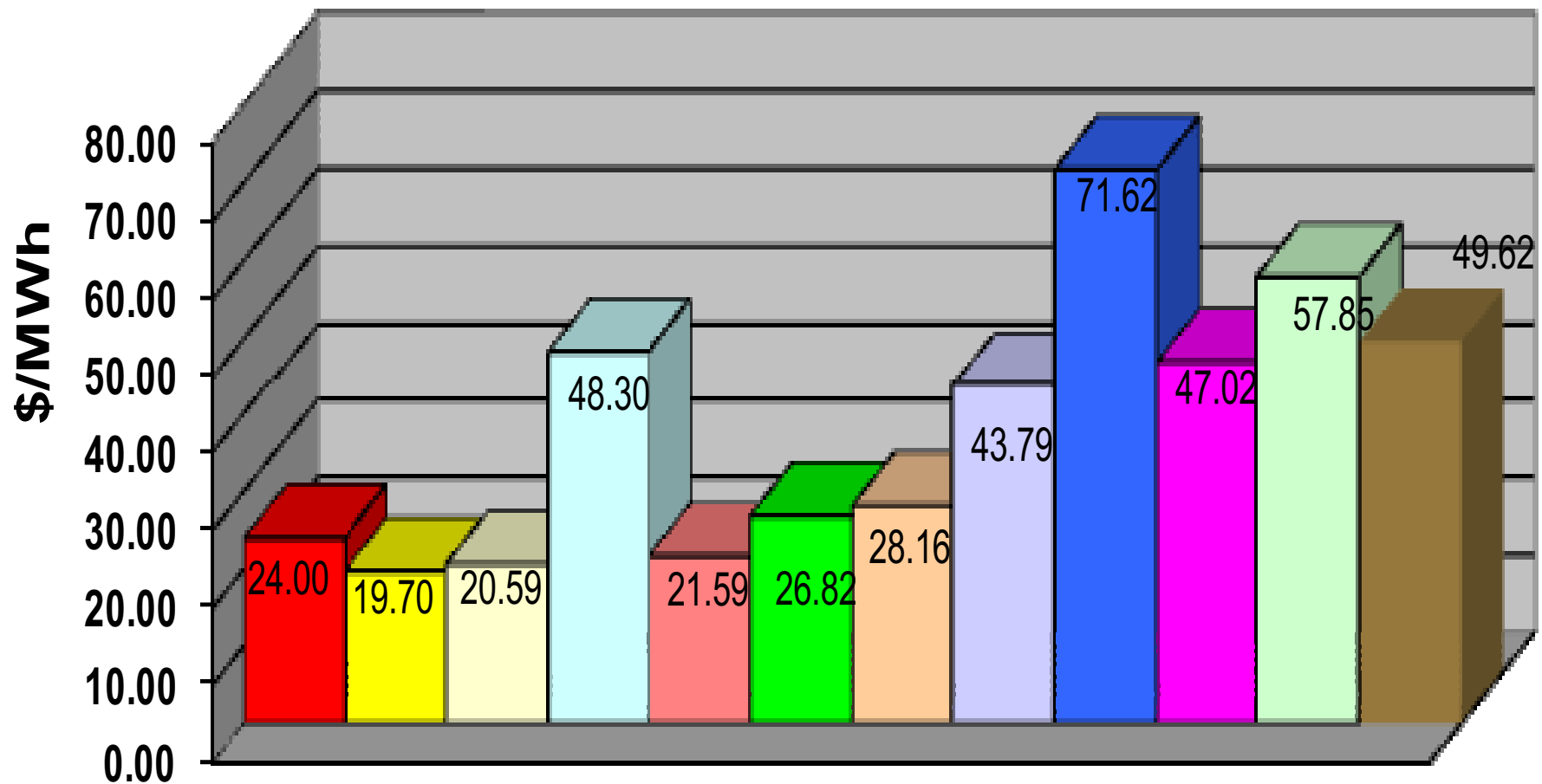


Cinergy Daily Prices \$/MWh 2000 - Dec 2008



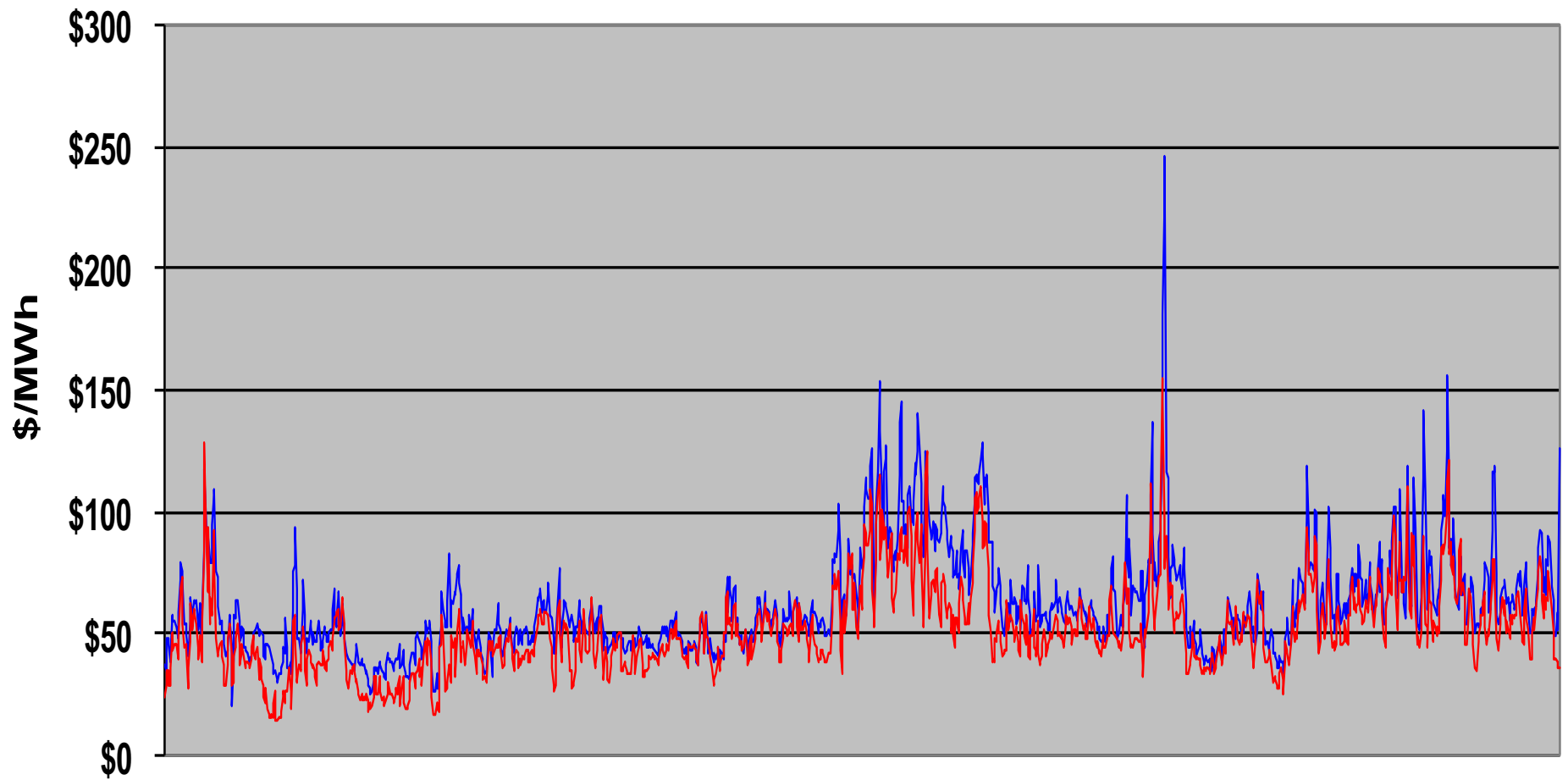
Year 2000 - Dec 2008

Into Cinergy Daily On-Peak Avg Price Qtr 4 1997 - 2008

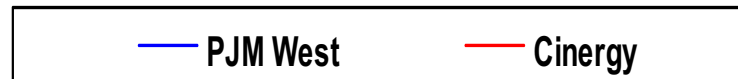


■ 1997 ■ 1998 ■ 1999 ■ 2000 ■ 2001 ■ 2002 ■ 2003 ■ 2004 ■ 2005 ■ 2006 ■ 2007 ■ 2008

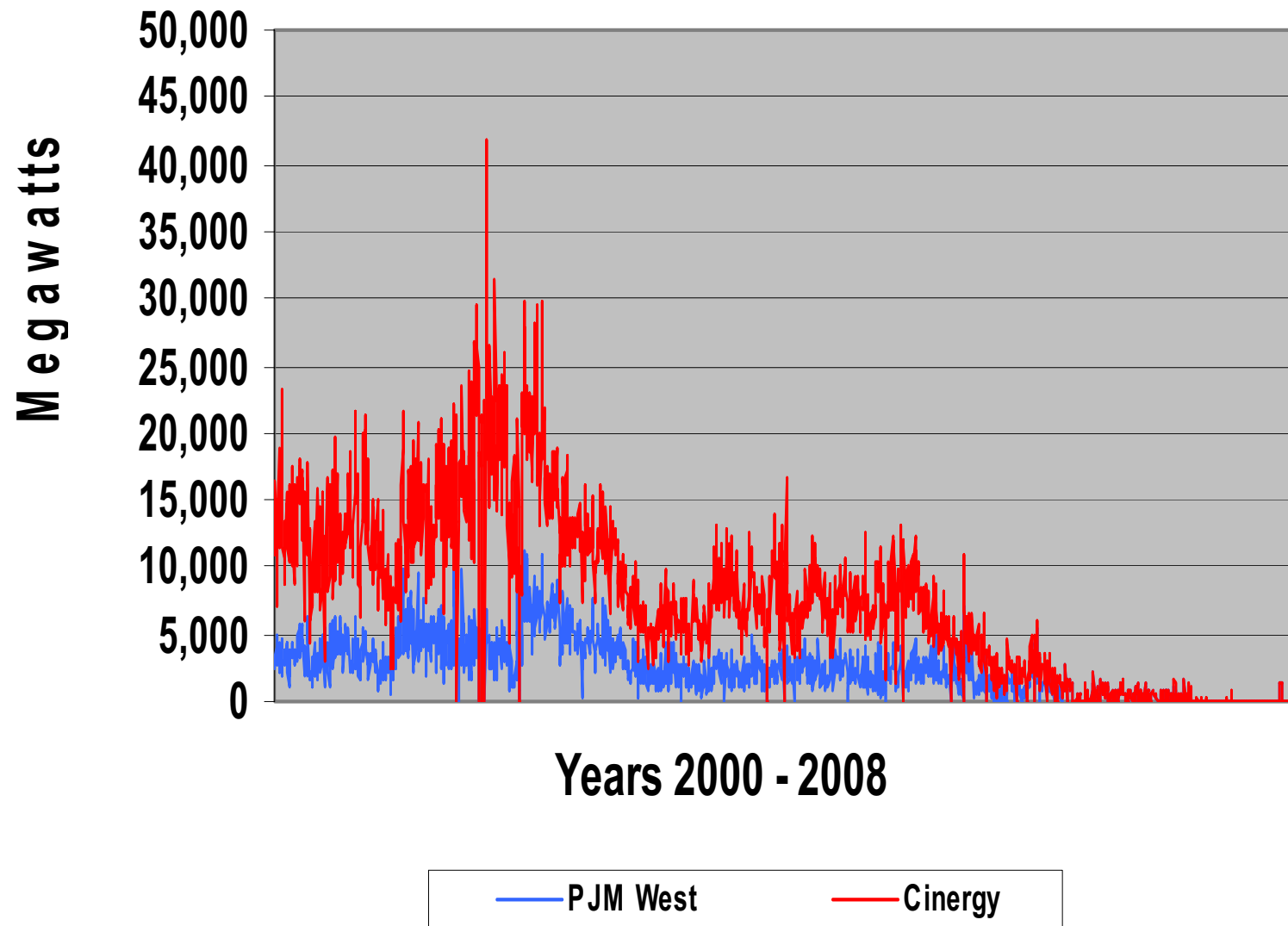
Day-ahead prices PJM West vs. Cinergy Hub



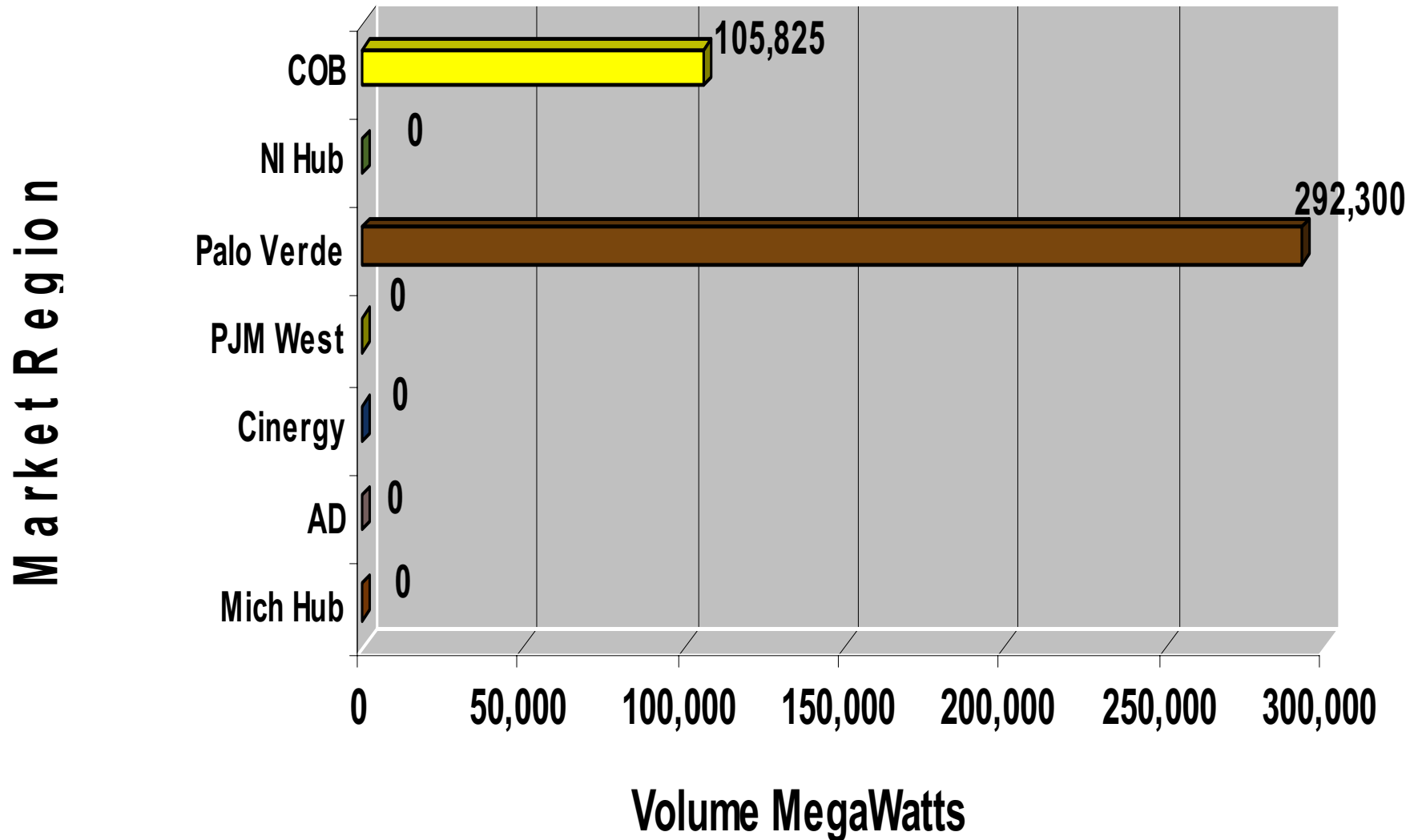
Years 2003 - Dec 2008



Daily Volume traded: PJM West vs. Cinergy Hub



2008 YTD Yearly Volume-Megawatts

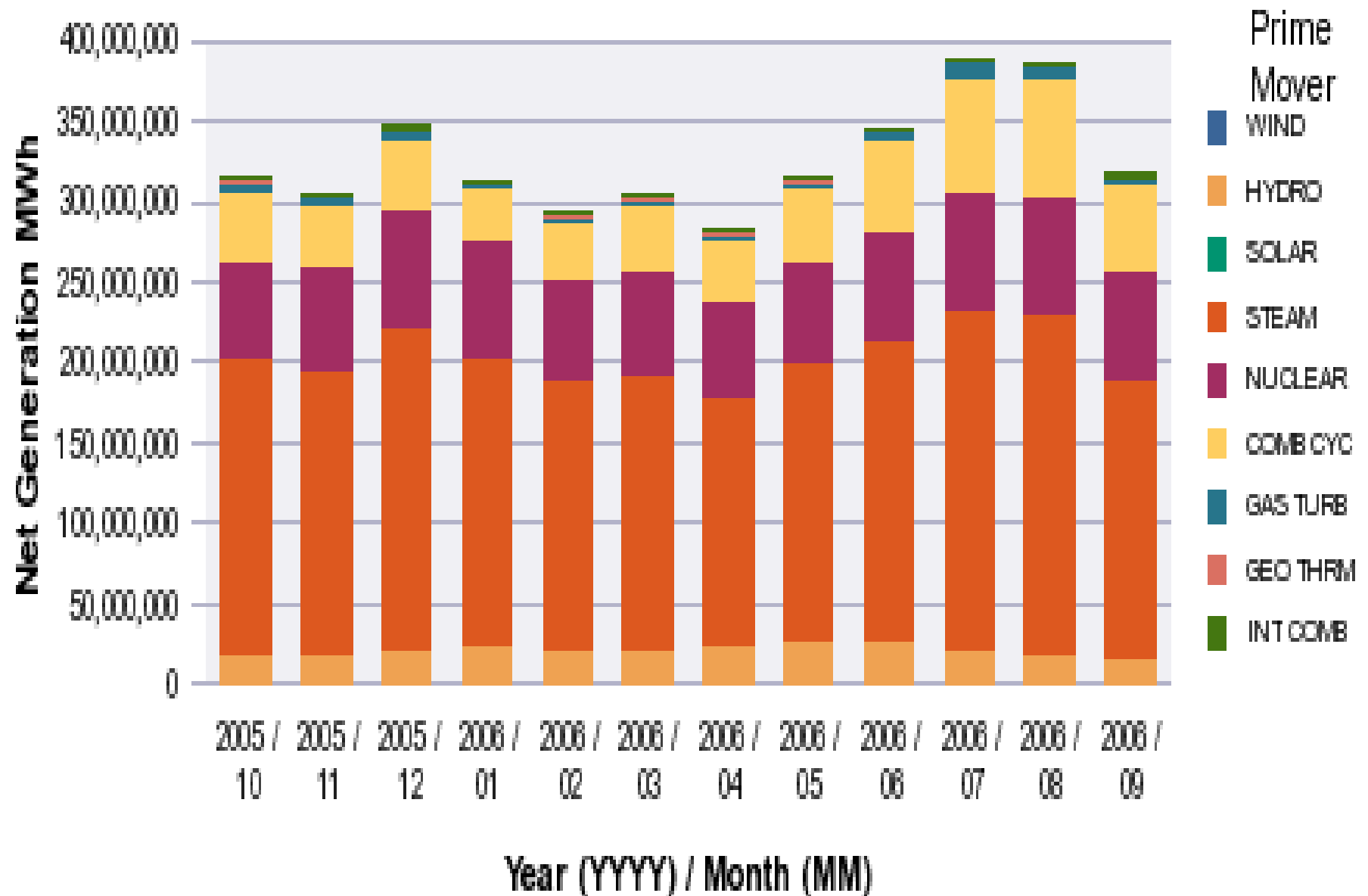




Supply Monitoring

- Regional Scope
- Existing Generating Capacity
- Retirements
- New Power Plants
- Input Prices
- Regional Demand/Supply Assessment
- Transmission Congestion

Generation by Prime Mover Rolling 12 months



Generation by Fuel - Most Recent 12 Months

Fuel Type	Net Generation MWh	Percent of Total Generation
Coal	1,963,597,320	50.00%
Uranium	793,710,701	20.21%
Natural Gas	740,884,164	18.87%
Water	247,085,595	6.29%
Other	104,842,514	2.67%
Oil	57,182,439	1.46%
Petcoke	19,852,230	0.51%
Sum:	3,927,154,963	



REGIONS | REPORTS | SETTINGS | WEATHER | HELP

Last Updated Plant: Harrison County Power Project
12/09/08 13:55 EST

NRC Report Update: 12/09/08 06:06

National

Temperature Map ☒ Show ☐ Hide

Name: Kewaunee

Owner: Dominion

Type: Nuclear

City: Kewaunee

State: WI

NERC ID: 8024

Last Updated: 12/09/08 13:49

Output (MW): 550

Capacity (MW): 560

ALERTS

12/09/08 13:34: [Bruce](#) reported:
Genscape Alert: Output fell 450 MW
over 3 hours

12/09/08 11:10: [New Madrid](#) reported:
Genscape Alert: Output rose above
210 MW

12/09/08 09:44: [Columbia](#) reported:
Genscape Alert: Output rose above
850 MW

12/09/08 09:33: [J M Stuart](#) reported:
Genscape Alert: Output rose above
1990 MW

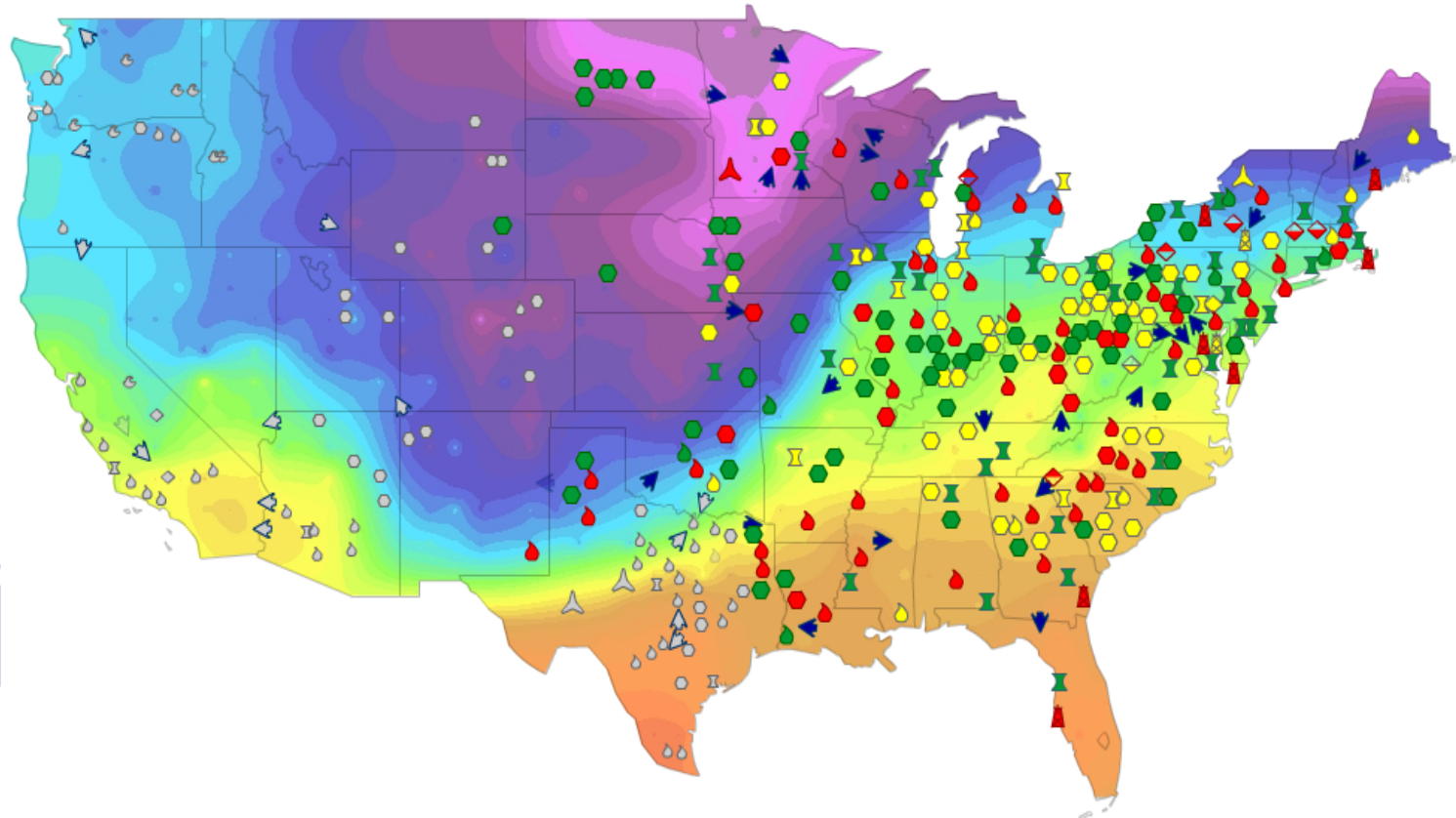
12/09/08 08:45: [Wabash River](#) reported:
Genscape Alert: Output fell below 600
MW

12/09/08 08:33: [Joliet 29](#) reported:
Genscape Alert: Output rose above

NOTES

All contents and information copyright Genscape, Inc. 2002-2008® U.S. Patent Nos. 6,714,000; 6,771,058; 6,956,764 patents pending.

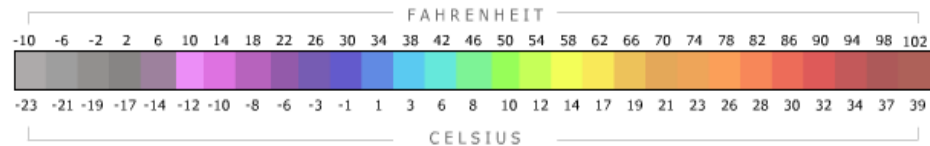
Map Images derived from maps copyright 2001, Map Resources, Lambertville, NJ 08530
www.mapresources.com



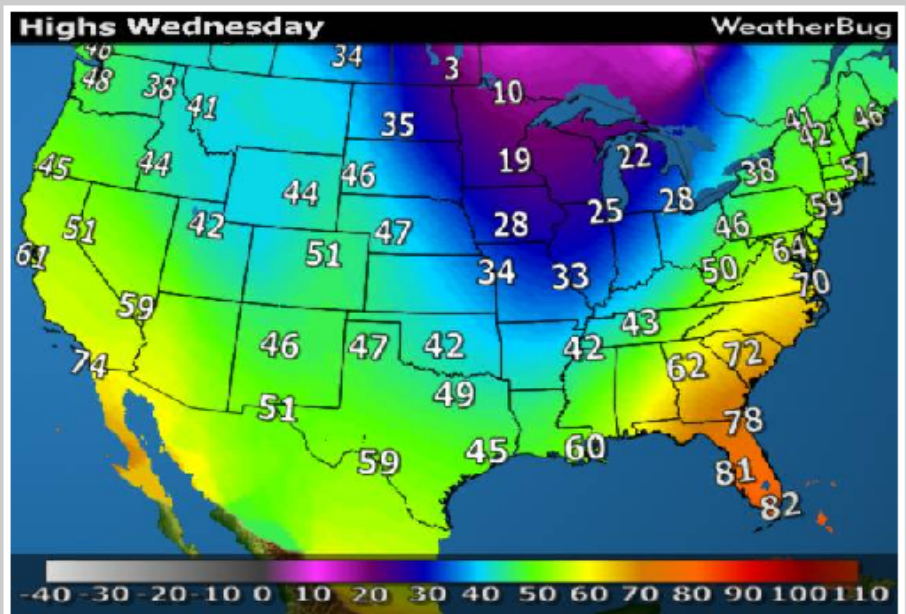
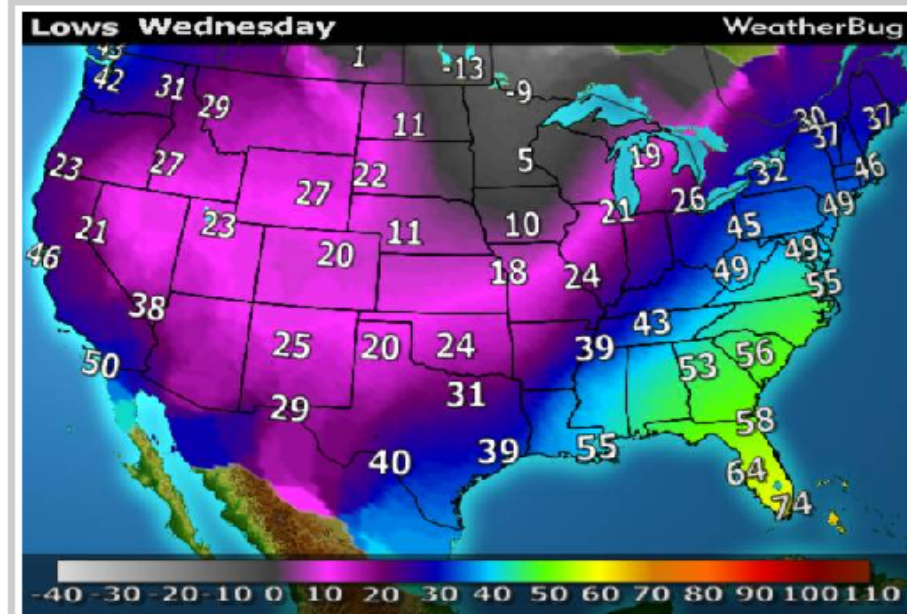
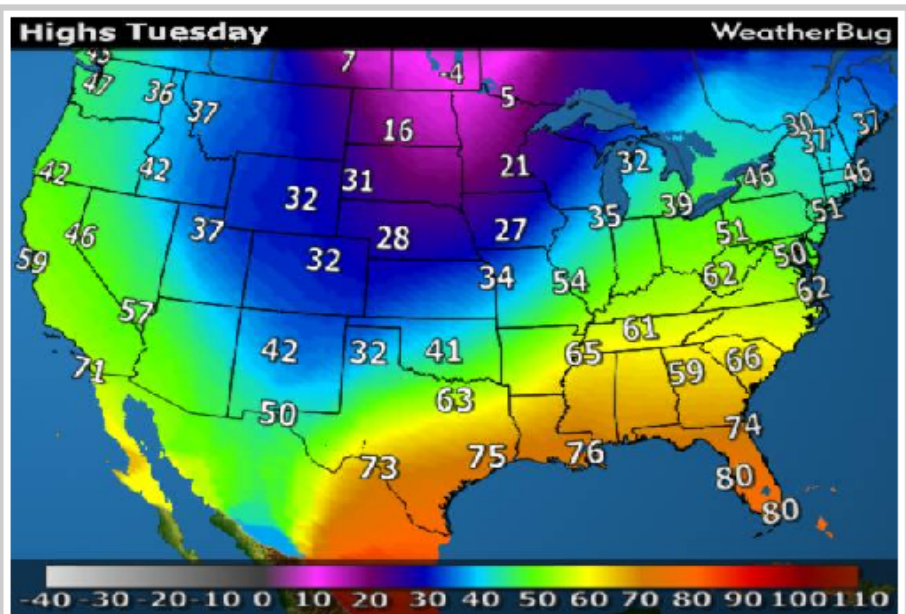
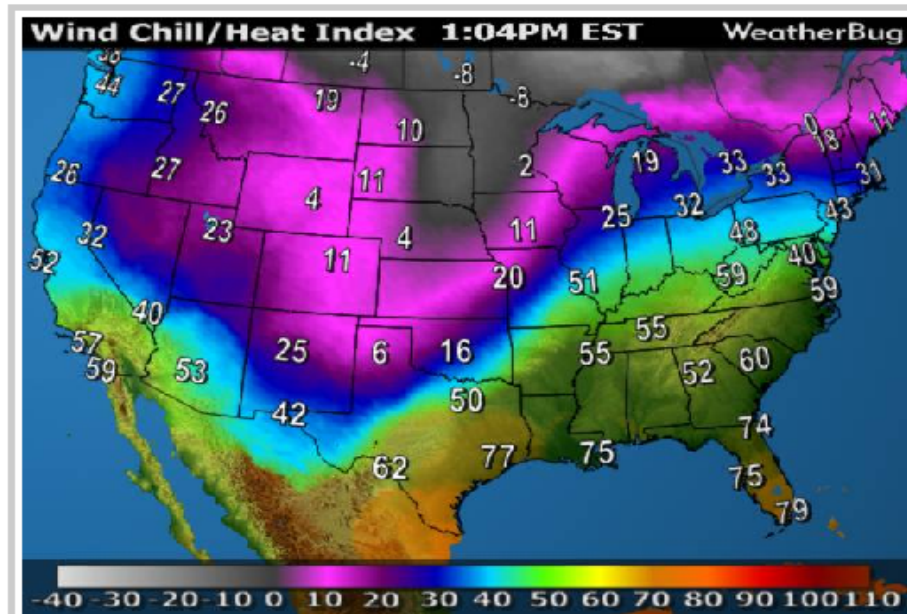
Temperature Map Color Key

Last Update: 12/09/2008 13:49 EST

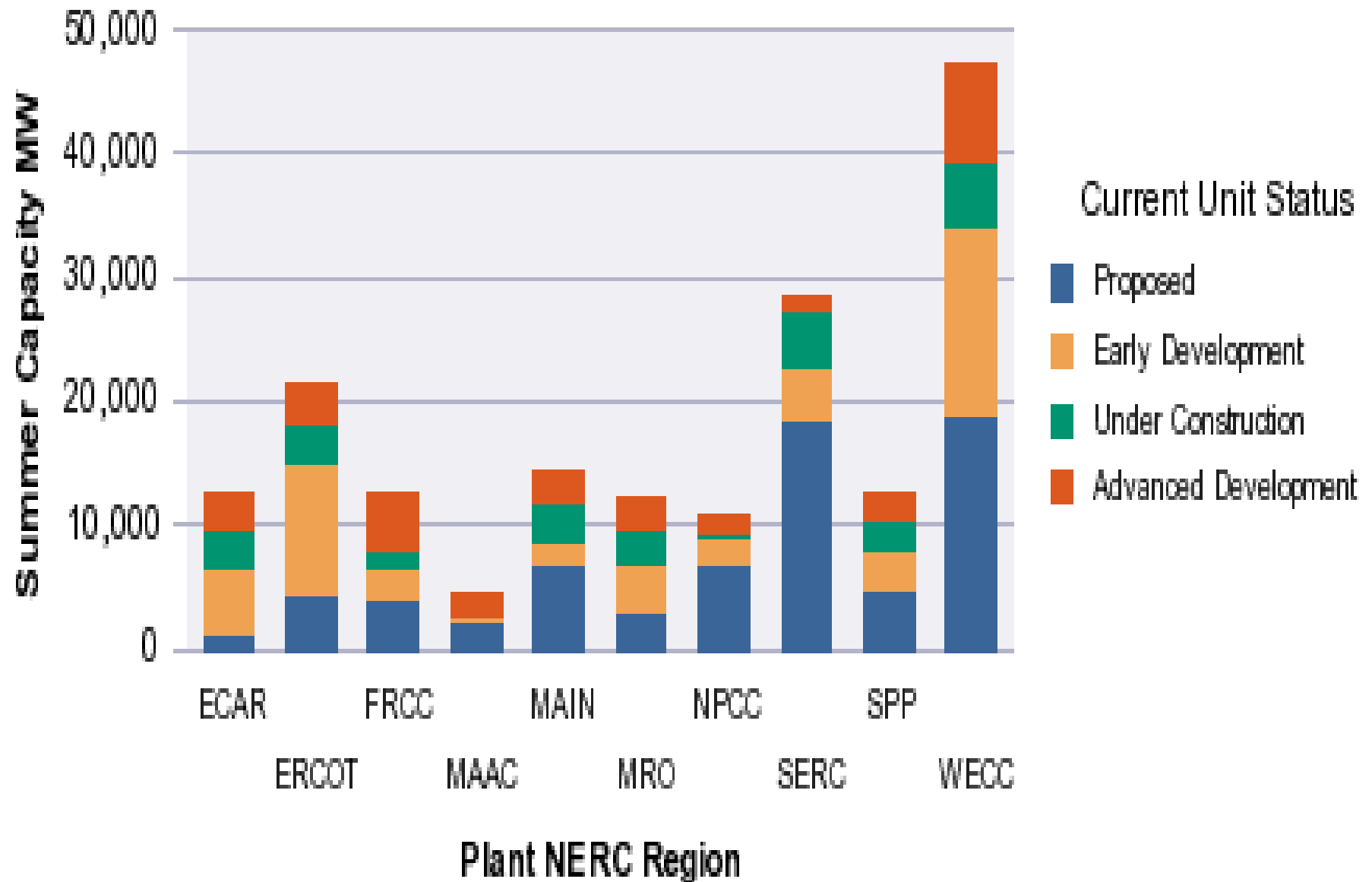
AMS Energy Services



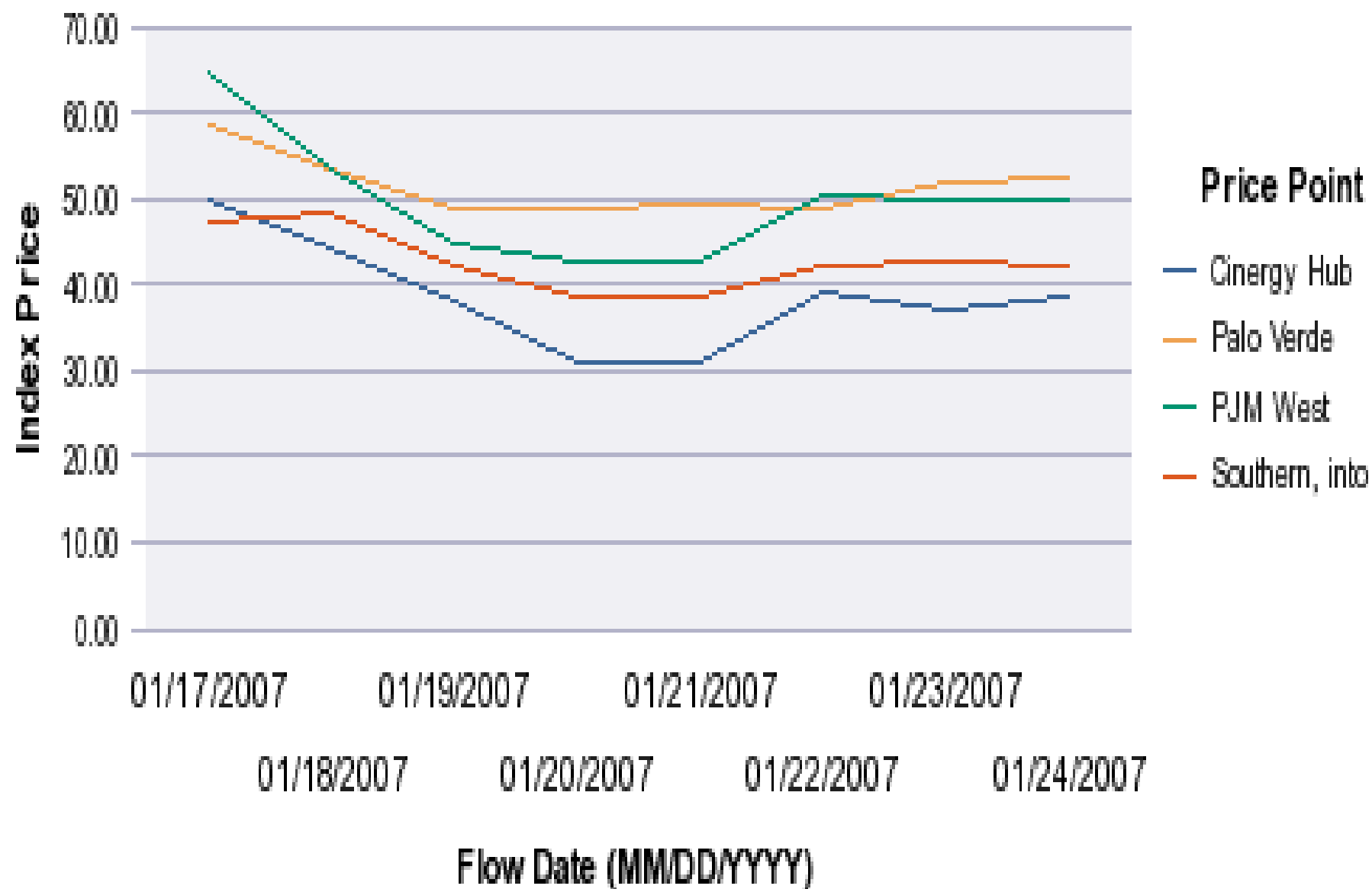
Connected To Server

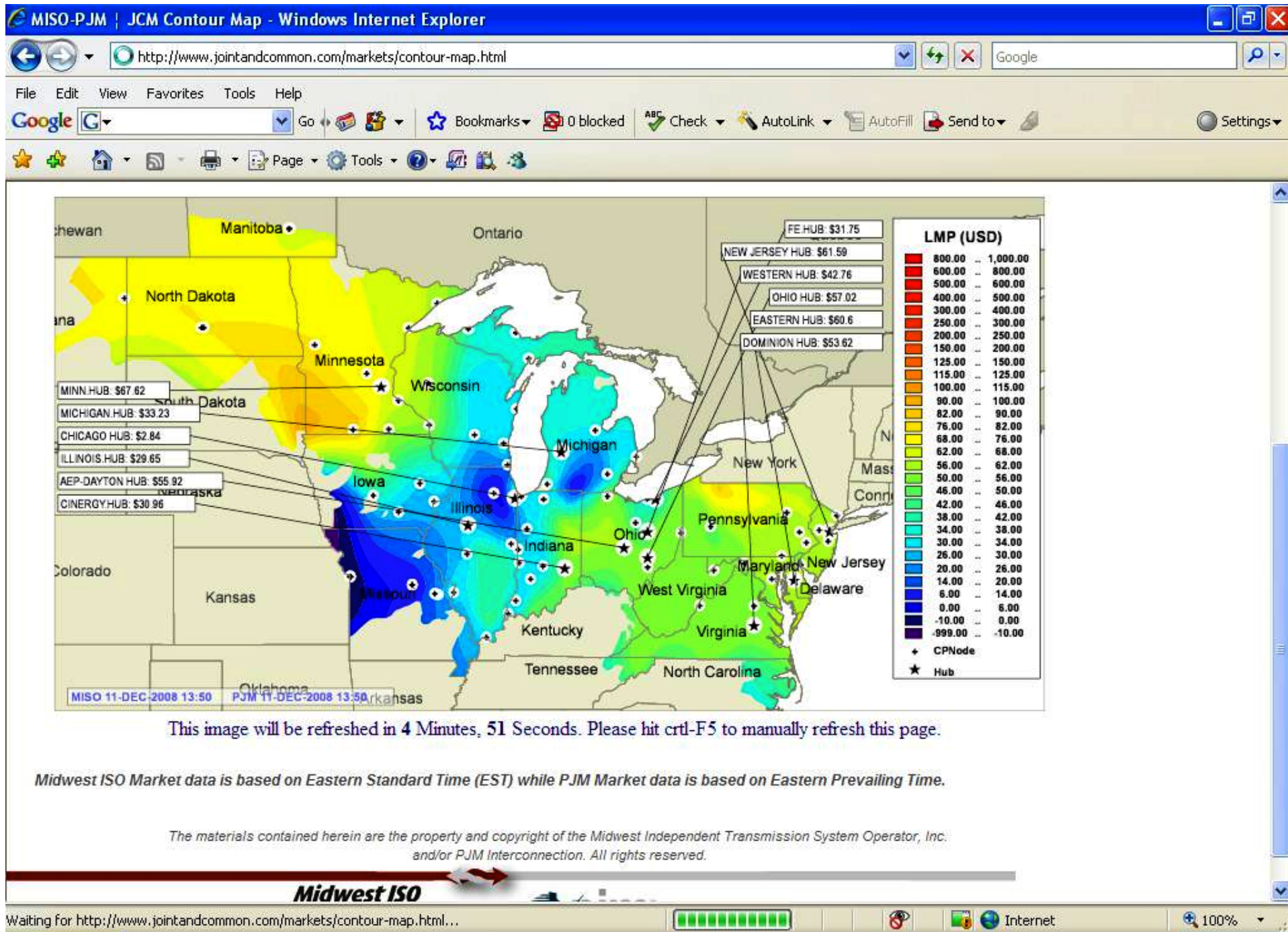


New Capacity by Current Status and NERC Region

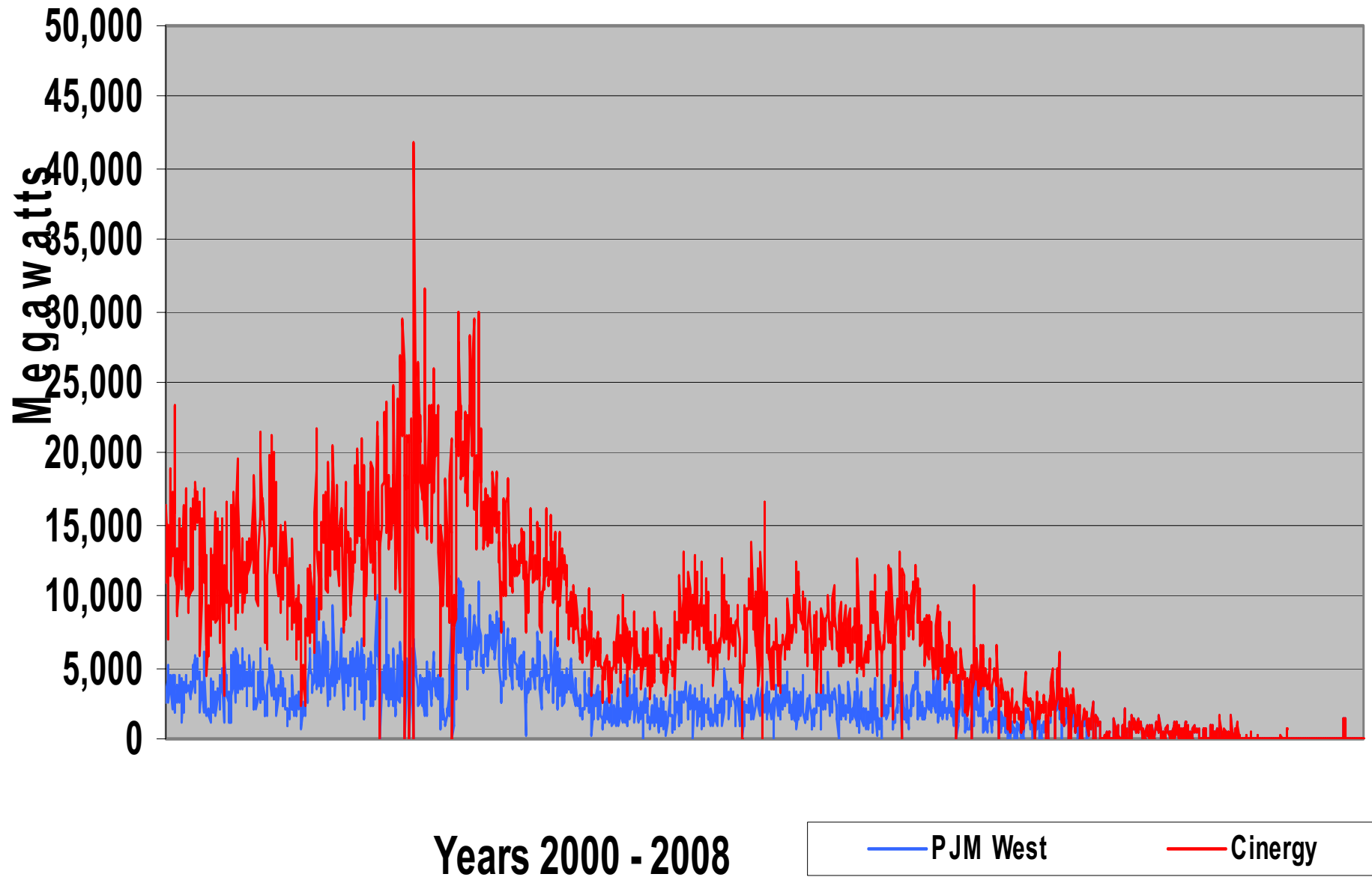


Megawatt Daily Prices Last 7 Days



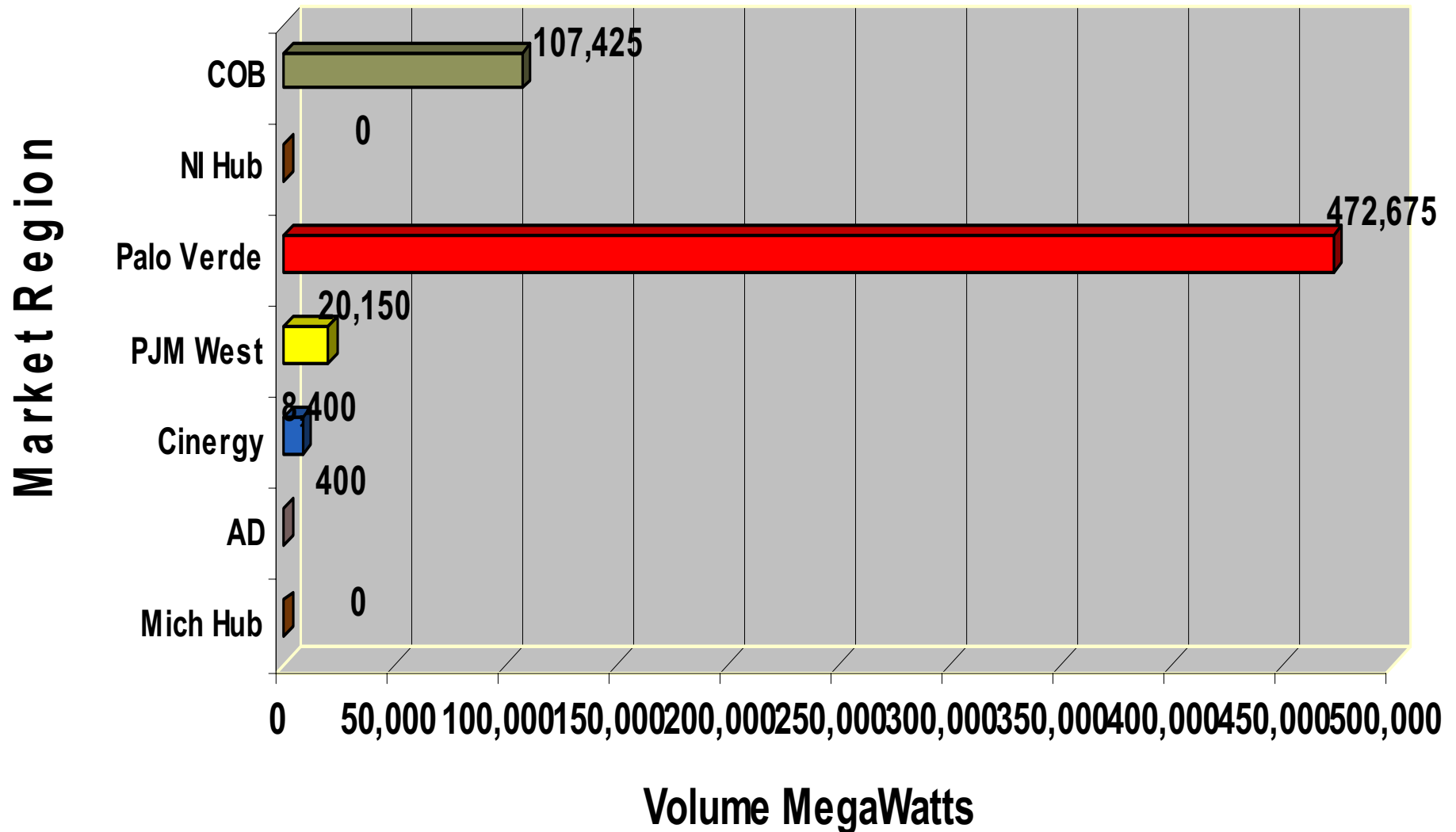


Daily Volume traded: PJM West vs. Cinergy Hub



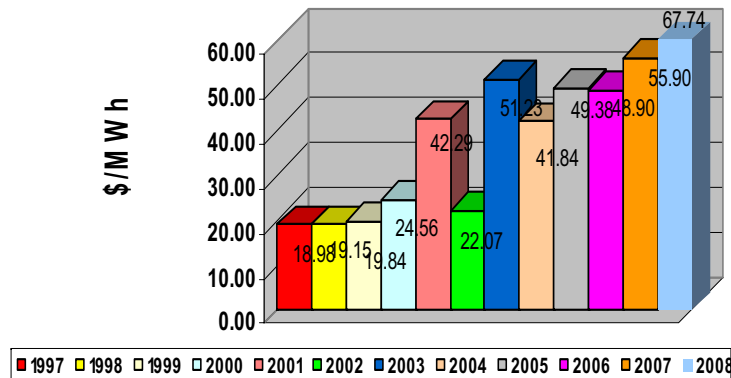
Annual MegaWatts by Region

2007 YTD Yearly Volume-Megawatts

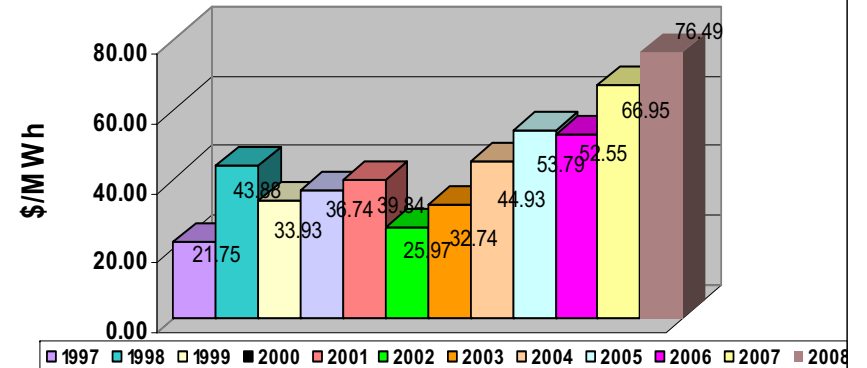


Daily Average Price

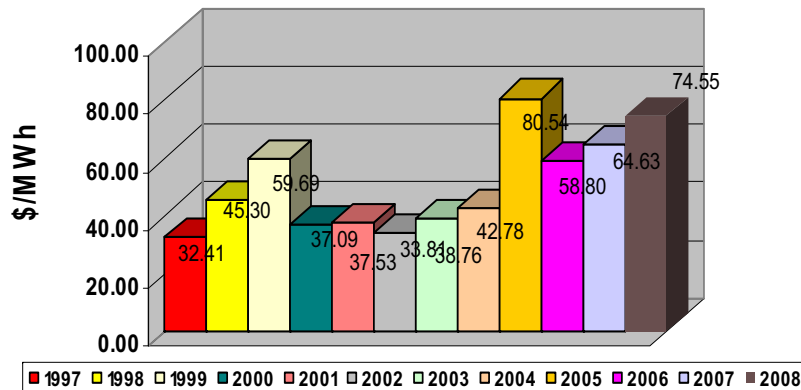
Into Cinergy Daily On-Peak Avg Price Qtr 1
1997 - 2008



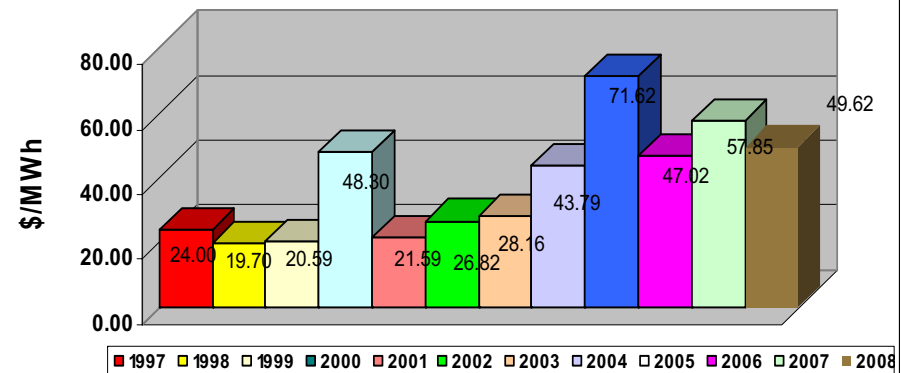
Into Cinergy Daily On-Peak Avg Price Qtr 2
1997 - 2008



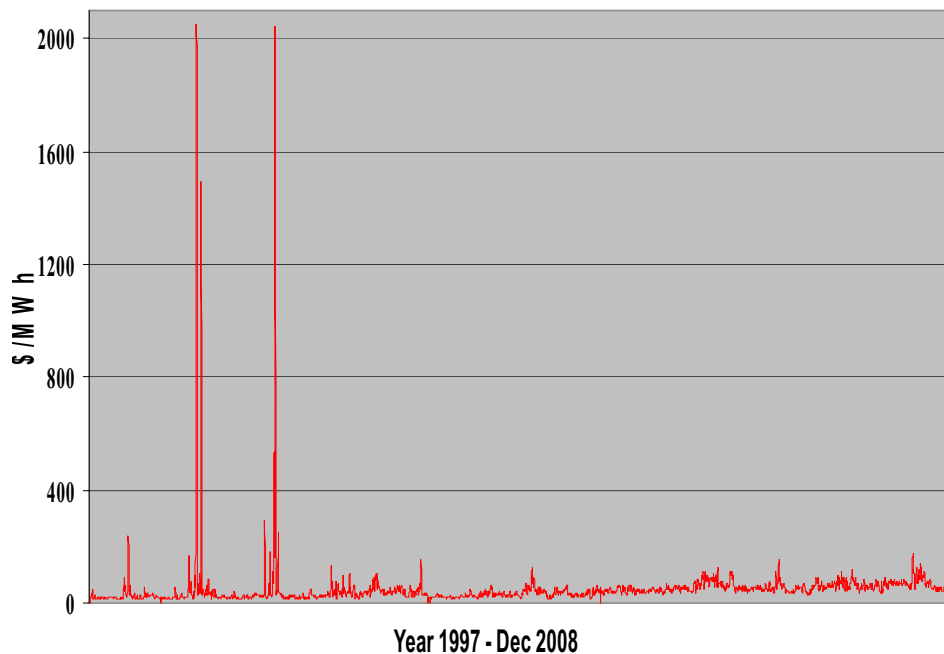
Into Cinergy Daily On-Peak Avg Price Qtr 3
1997 - 2008



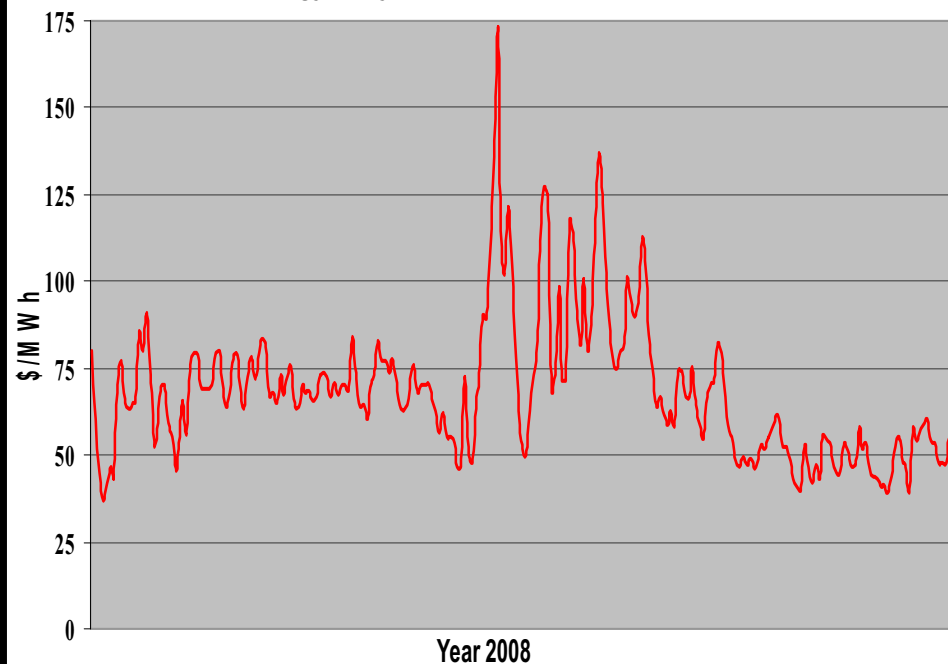
Into Cinergy Daily On-Peak Avg Price Qtr 4
1997 - 2008



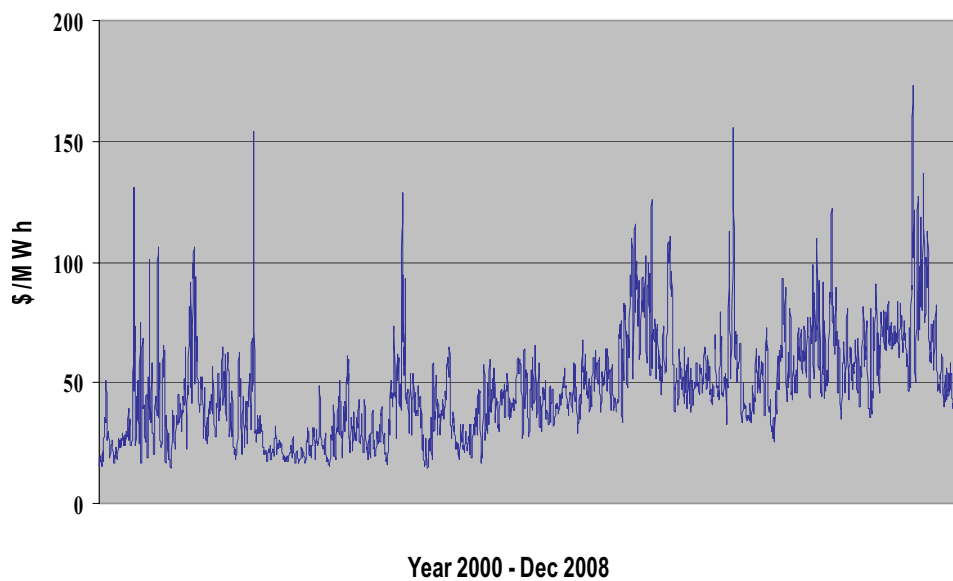
Cinergy Daily Prices \$/MWh 1997- Dec 2008



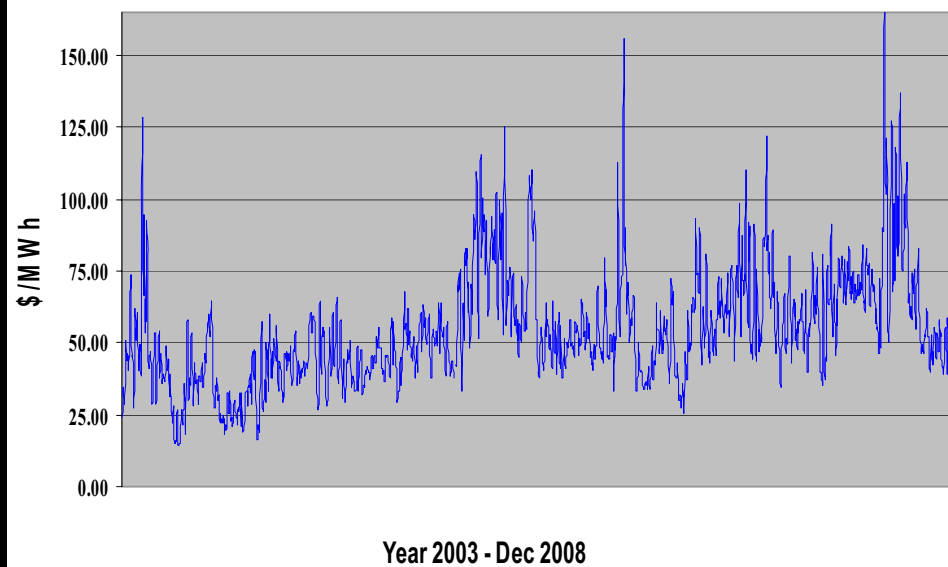
Cinergy Daily Prices \$/MWh Jan-Dec 2008



Cinergy Daily Prices \$/MWh 2000 - Dec 2008

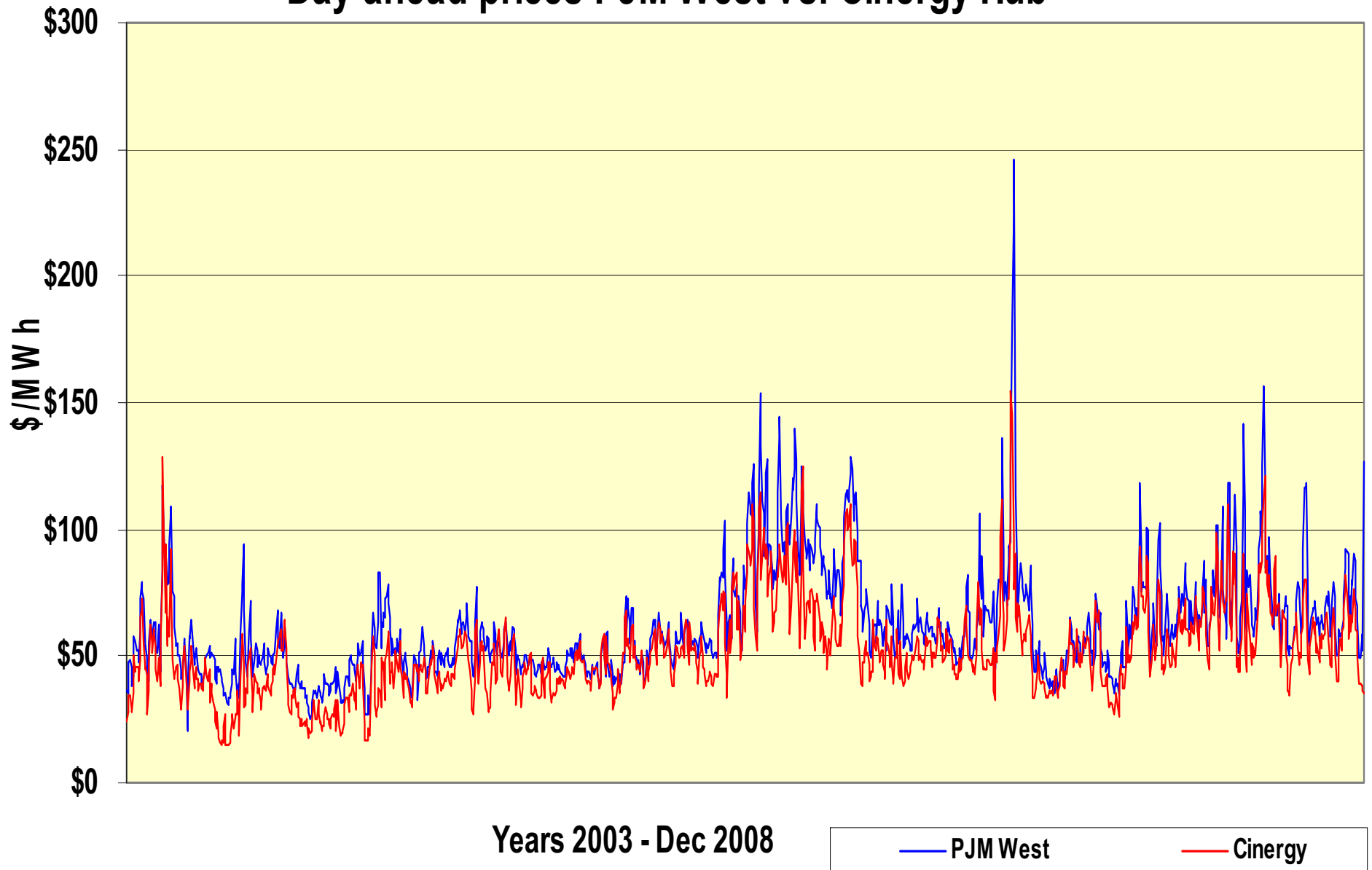


Cinergy Daily Prices \$/MWh 2003 - Dec 2008



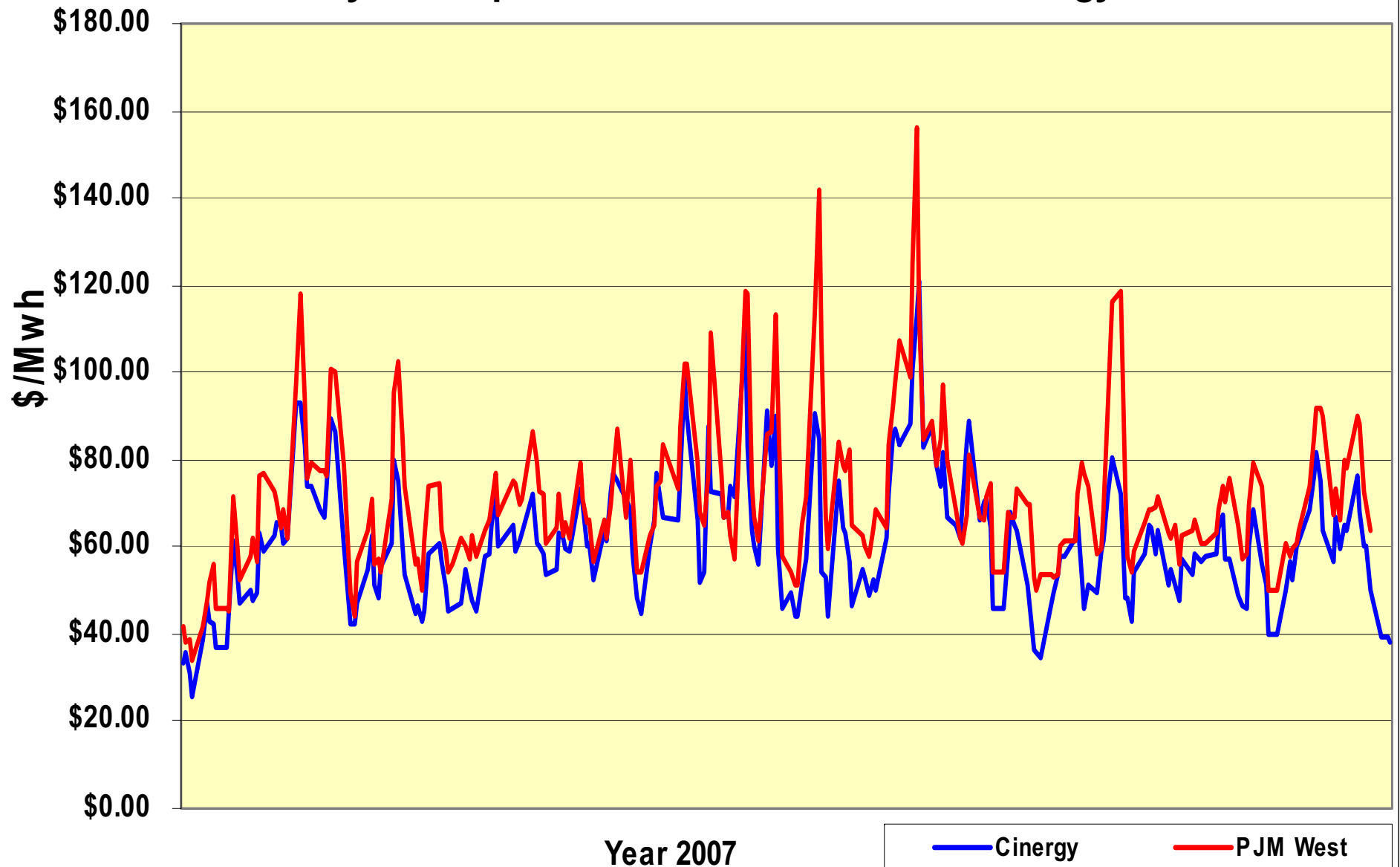
Day-Ahead Prices

Day-ahead prices PJM West vs. Cinergy Hub



Day-Ahead Prices

2007 Day-ahead prices \$/Mwh: PJM West vs. Cinergy Hub



NYMEX Crude Oil Futures Close (Front Month)





One Tool Developed

- Model employing a neural network-based algorithm for monitoring reasonableness of prices in wholesale electricity markets
- Relationship between published index prices and several independent variable.



Host of Variables

- Generation availability/unit production
- Fuel supply/prices
 - Coal
 - Gas
- Transmission Availability
- Weather
 - Temperature
 - Wind velocity
- Historical Wholesale Prices

Variable Definitions

➤ d_i is a binary variable that identifies the day, where $i=1,2,3,4$, or 5.

d_1 is the identifier for Monday, and thus, takes a value of 1 on Monday, and a value of 0 on any other day.

d_2 is the identifier for Tuesday, and thus, takes a value of 1 on Tuesday, and a value of 0 on any other day.

.

.

d_5 is the identifier for Friday, and thus, takes a value of 1 on Friday, and a value of 0 on any other day.

➤ t_{ij}^{\max} is maximum daily temperature on day i in region j , $j=1,2$, or 3

➤ t_{ij}^{\min} is minimum daily temperature on day i in region j , $j=1,2$, or 3

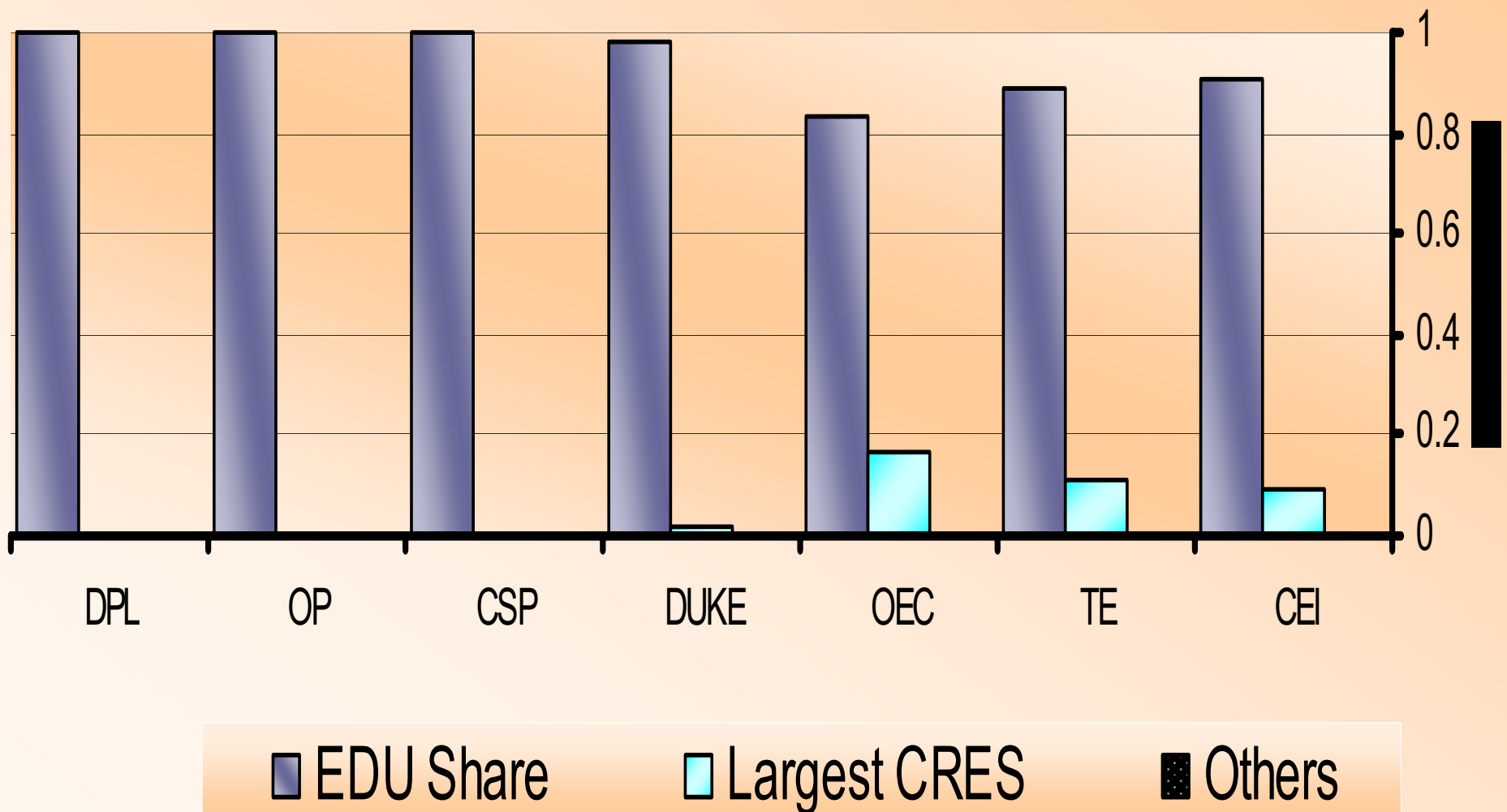
$j=1$ represents the Columbus region.

$j=2$ represents the Cleveland region.

$j=3$ represents the Cincinnati region.

RESIDENTIAL Sector Local Electric Utility Market Shares and Alternative Electric Supplier Market Shares

June 2008



Variable Definitions (Cont.)

- p_{ik} is the percent production on day i by power plant k , $k=1,2,..12$

$$p_{ik} = \frac{\text{Plant } k \text{ Generation @ 2pm on day } i}{\text{Plant } k \text{ capacity}} \times 100$$

Note: The 12 power plants that we collect data on (daily @ 2pm) constitute about 60% of the electric generation in Ohio.

- g_i is the daily spot market price of natural gas (in \$/MMBtu) at the Henry delivery hub on day i .
- e_i is the daily on-peak wholesale price of electricity (in \$/MWh) at the PJM West delivery hub on day i .



Preliminary results indicate the model can predict next-day index prices with an error rate of 5-6%.

We have used this to monitor wholesale prices at specific trading hubs in and around Ohio.

If we find a significant divergence, action may be pursued.



Retail Market

- Customer Switching
- Alternative Supplier Availability
- Barriers to Entry
- Market Power Abuses

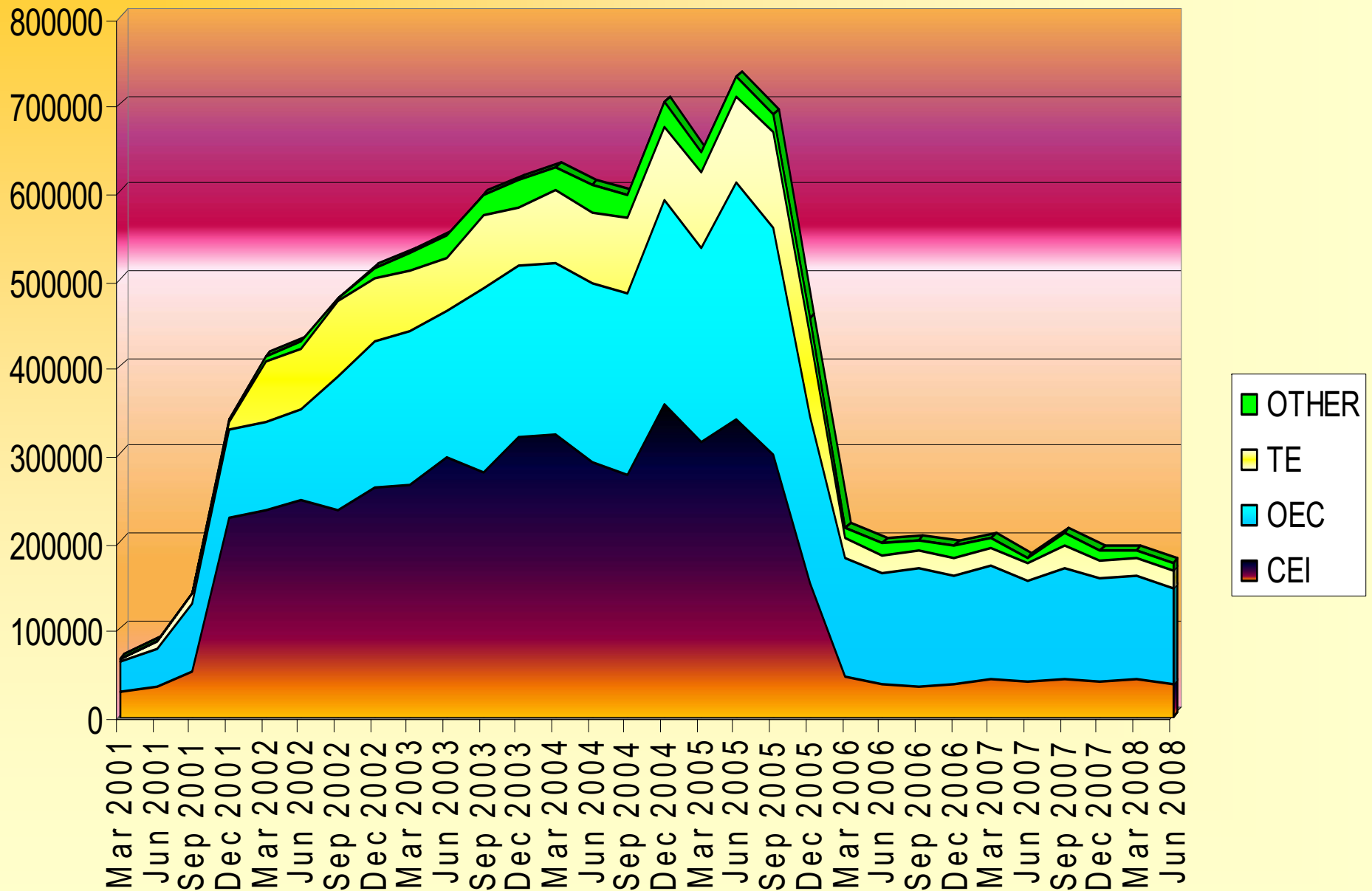


The other side of the transaction...

- In any market you need two categories of participants, sellers and buyers.
 - While this seems to be trivial observation on its face, the fact remains that the vast majority of the available direct information is on the sellers.
 - However, the attitudes and beliefs of end users can be inferred from other evidence.

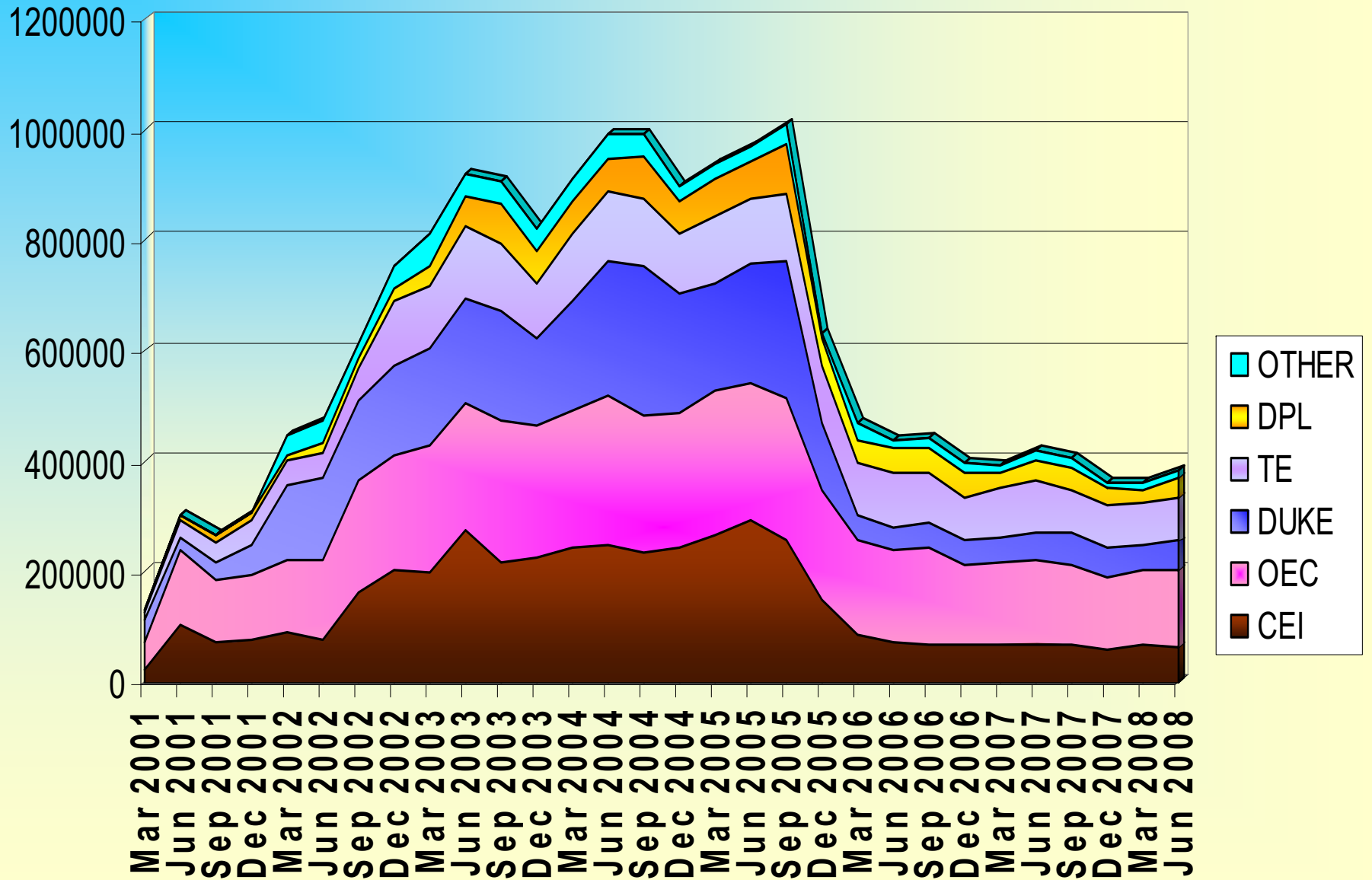
Electric Choice RESIDENTIAL MWh Switching

January 2001 - June 2008

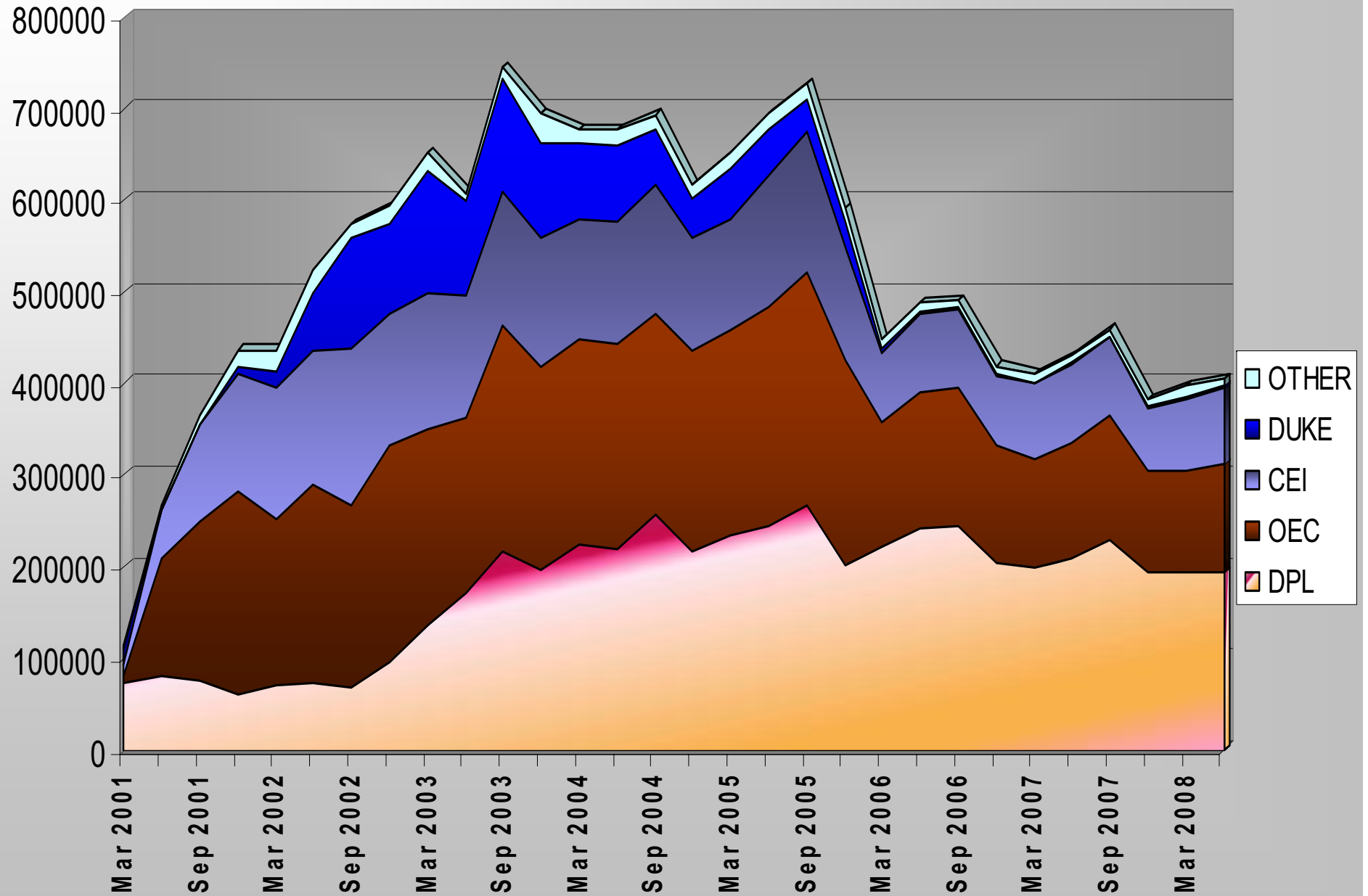


Electric Choice COMMERCIAL MWh Switching

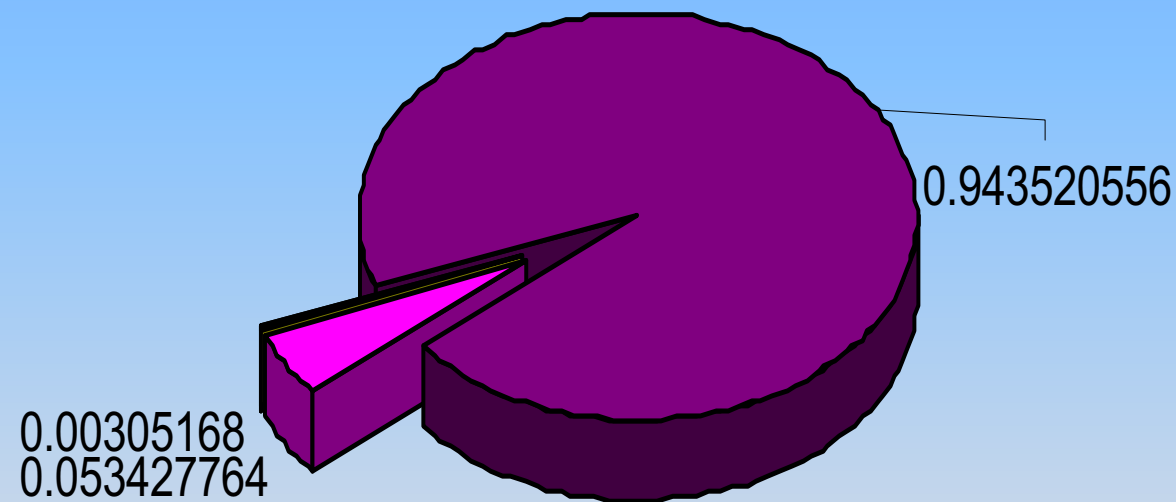
January 2001 - June 2008



Electric Choice INDUSTRIAL MWh Switching
January 2001 - June 2008

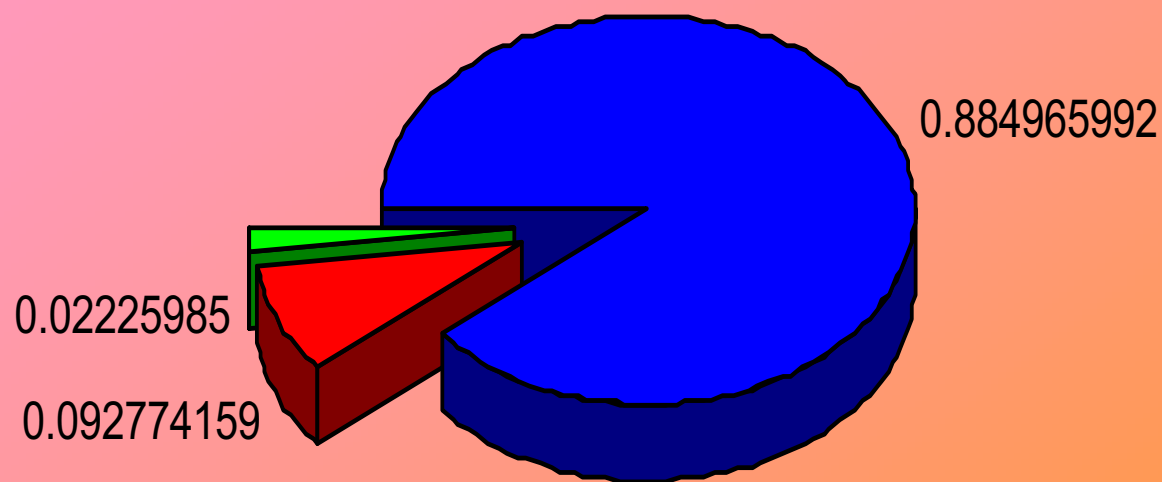


June 2008
Market Shares of EDUs, EDU Affiliates and Other CRES
Providers in Ohio
Residential Sector MWh Sales



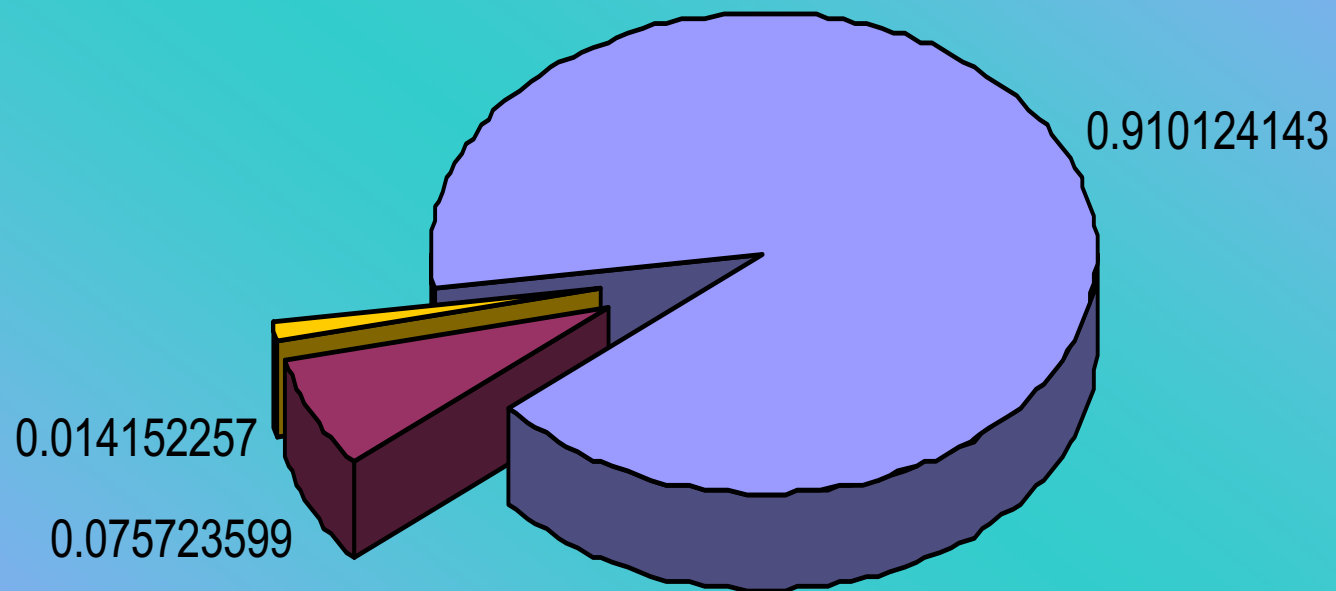
■ Affiliate Share ■ Other CRES Share ■ EDU Share

June 2008
Market Shares of EDUs, EDU Affiliates and Other CRES Providers
in Ohio
Commercial Sector MWh Sales



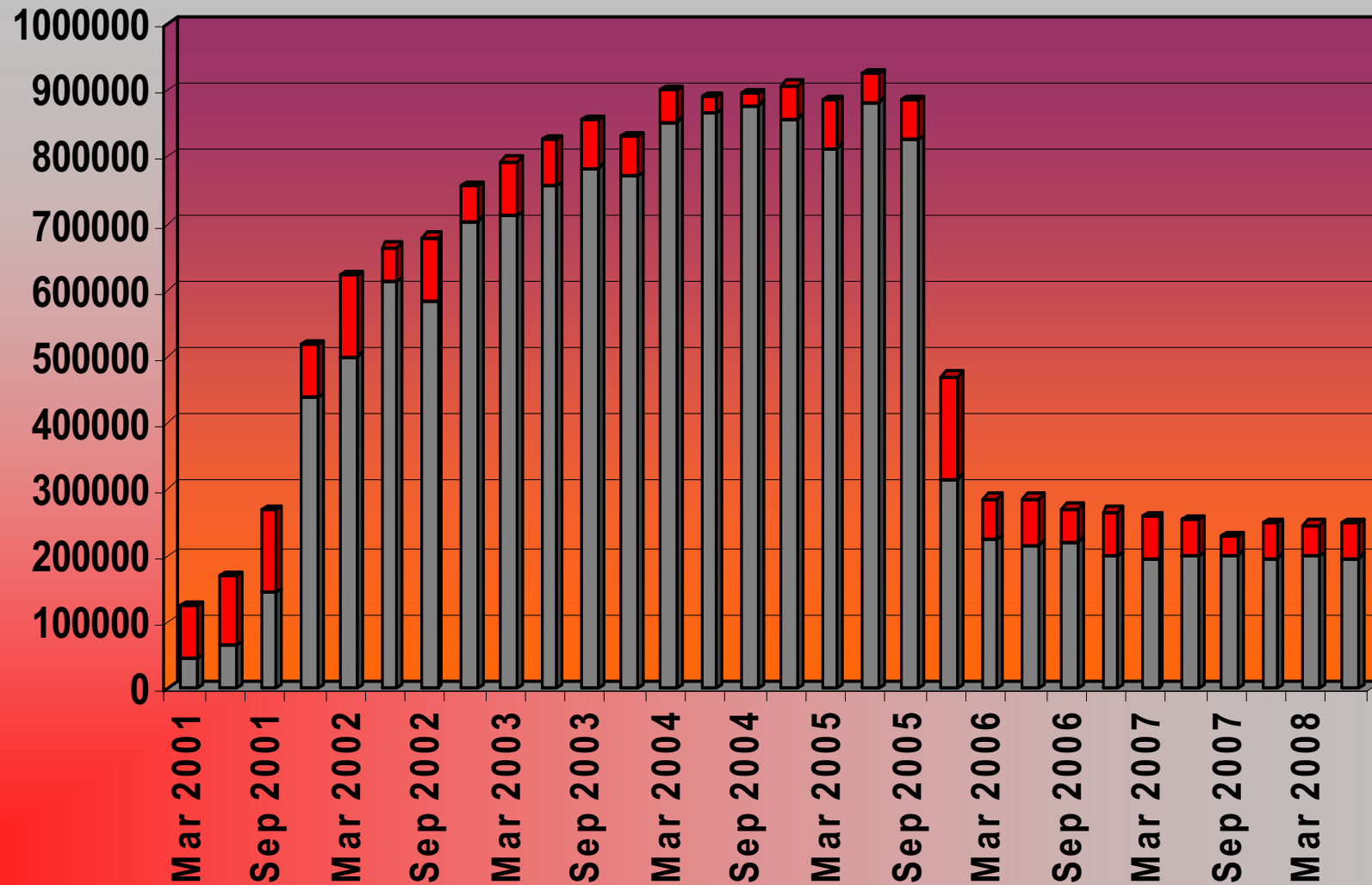
■ Affiliate Share ■ Other CRES Share ■ EDU Share

June 2008
Market Shares of EDUs, EDU Affiliates and Other CRES
Providers in Ohio
Industrial Sector MWh Sales



■ Affiliate Share ■ Other CRES Share ■ EDU Share

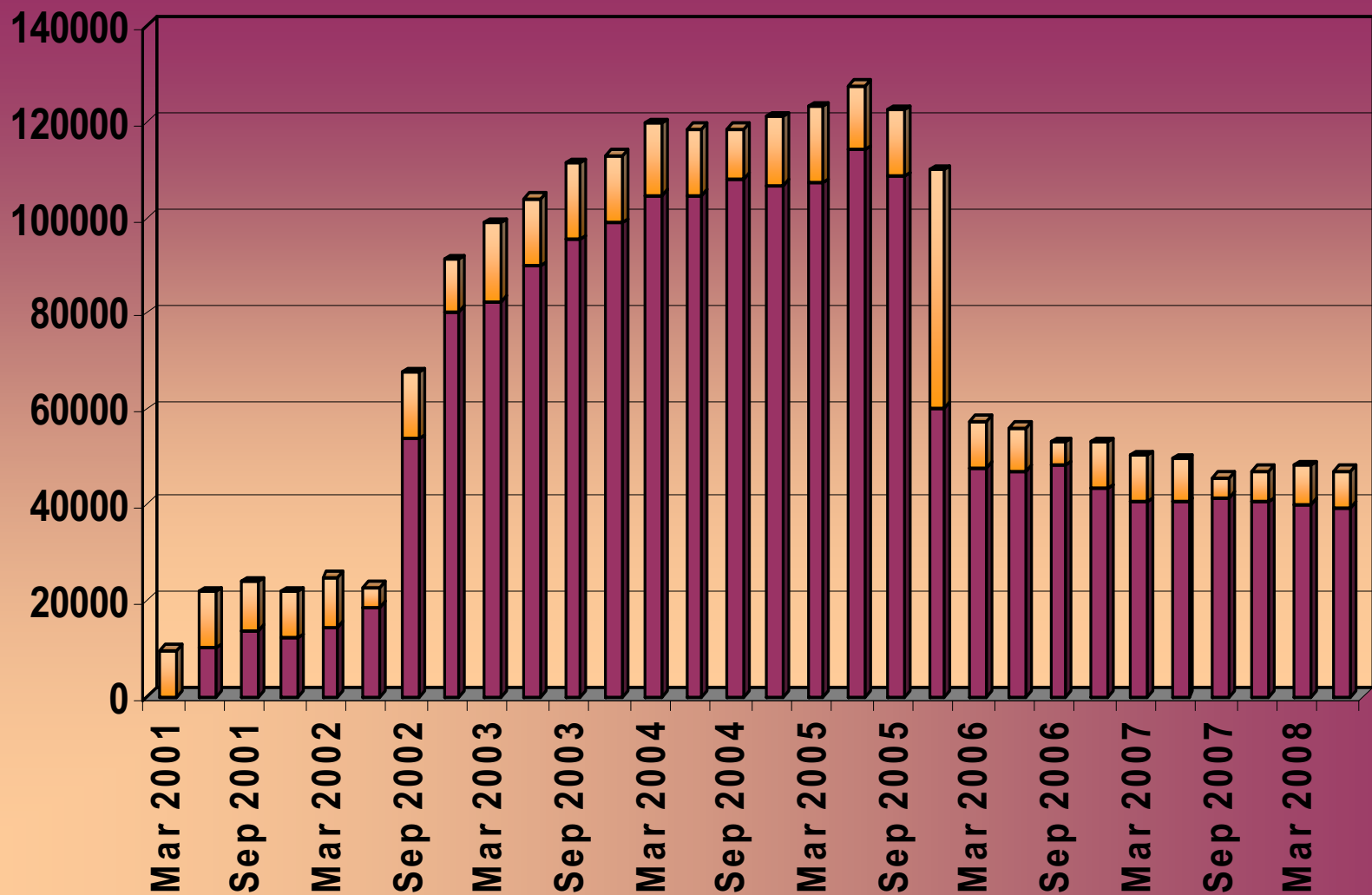
Number of RESIDENTIAL Customer Switches in Ohio for the years 1st Qtr 2001 - 2nd Qtr 2008



■ Switching via aggregation

■ Other Switching

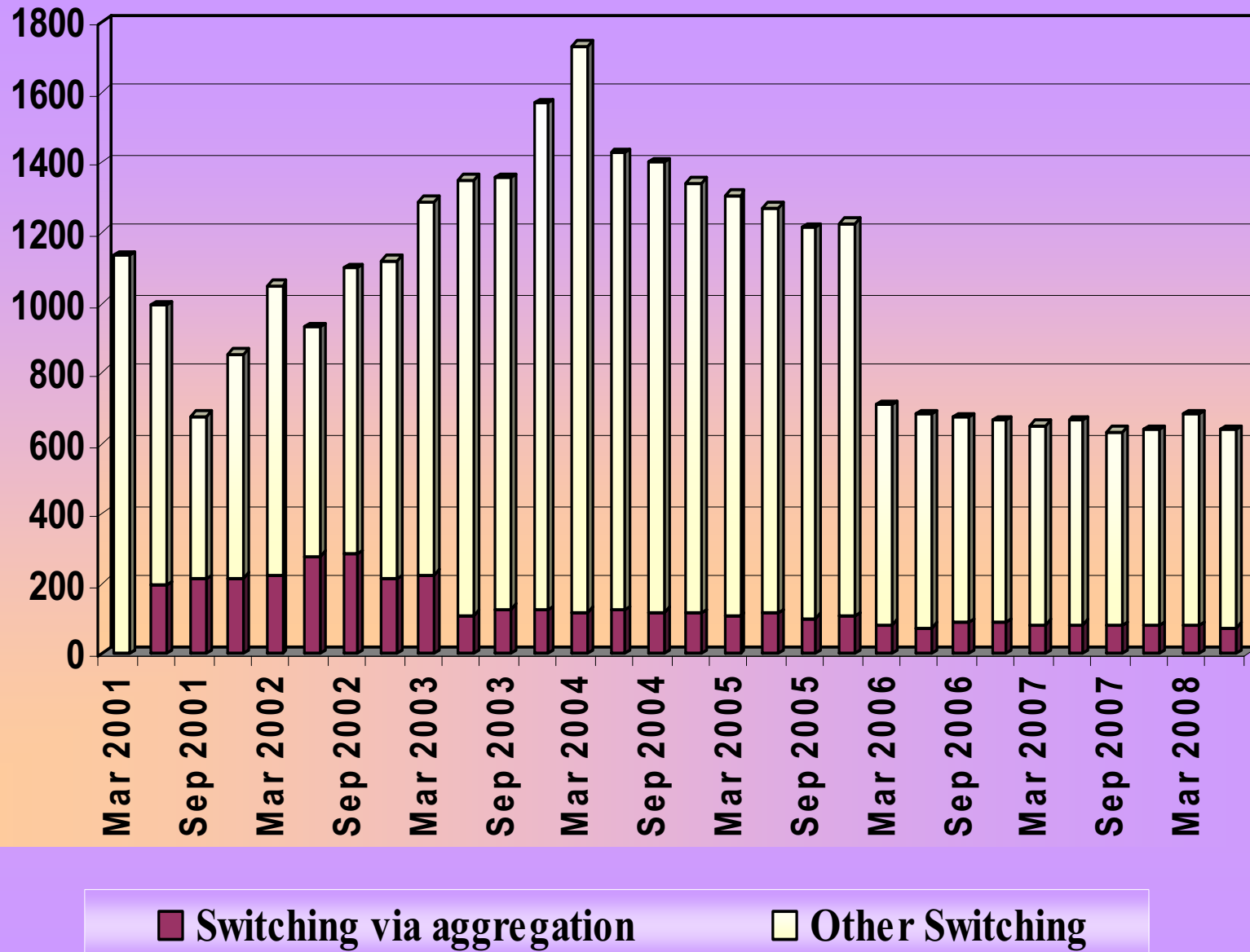
Number of COMMERCIAL Customer Switches in Ohio for the years 1st Qtr 2001 - 2nd Qtr 2008



Switching via aggregation

Other Switching

Number of INDUSTRIAL Customer Switches in Ohio for the years 1st Qtr 2001 - 2nd Qtr 2008





Demand Forecasting

- Independent Forecast of Demand
 - Economic growth
 - Weather
- Demand-Side Management Opportunities
- Transmission Planning/Forecast
- Congestion



Access to Transmission Provider's Data and Information

- hourly schedules, offers, actual output of generation resources
- external imports and exports
- reserved and scheduled transmission service into, out of, or through the region
- transmission limits (including temporary deratings)
- hourly flows
- generation and transmission facility outage data
- records of complaints by customers



Access to Transmission Provider's Data and Information (cont'd)

- dispatch of generation for energy, regulation, frequency or other operational orders
- redispatch of generation or other actions for transmission congestion management
- transmission service request logs, including the explanation for any refused, retracted or annulled requests
- generator interconnection request logs, including the disposition of the request and the explanation of any refused requests;



Data from Market Participants

Additional data or other information required to accomplish the objectives of the monitoring plan

- Production costs
- Opportunity costs
- Generating Logs
- Transmission Logs



Market Confidence

- MUST have clear rules and protocols to enhance investor confidence and trust
- Certainty and clarity provide this
- Accountability, autonomy, and authority
- Regulatory bodies have to prove their stability and independence and impartial decision-making capabilities
- Formal or semi-formal institutions



Market Confidence (continued)

- Coordination/communication problems, including between regulators
- Understand personalities, respect positions
- Protection of interests grow as geographic boundaries expand
 - (e.g., expand from state/national to regional/international approaches)
- Keep communication channels open through regular exchange
 - While parochial interests cannot necessarily all be met, these should at least be understood by all stakeholders
- Strive for consensus & compromise
 - Constructive dialogue keeps goals in sight & progress to be made



Confidentiality

- Is it overplayed?
- Are Protections Necessary?



Access to Transmission Provider's Data and Information

The Independent Market Monitor shall have access to the following:

- hourly schedules, offers, actual output of generation resources
- external imports and exports
- reserved and scheduled transmission service into, out of, or through the region



- transmission limits (including temporary deratings)
- hourly flows
- dispatch of generation for energy, regulation, frequency or other operational orders



- redispatch of generation or other actions for transmission congestion management
- transmission service request logs, including the explanation for any refused, retracted or annulled requests
- generator interconnection request logs, including the disposition of the request and the explanation of any refused requests;



- generation and transmission facility outage data
- records of complaints by customers



Consumer Intelligence

- Consumer Complaint Tracking
- Consumer Surveys
- Data Base Development



How do you know...

- Most direct observation is by means of survey analysis.
- Other analysis is possible for other consumer contact information
 - There is some inherent bias in this information, due to “self selection”, in that the customers asking questions tend to be more interested and informed.



Other information

- Since switching data is reported on a monthly basis, customer switches can be somewhat correlated with events.
- Customer contacts and requests for information from the Commission's Public Interest Center give some indication of customer attitudes and concerns
- The logs from the Commission's web pages (which record how many visitors and when, but not who) give similar indications.



Data from Market Participants

The Independent Market Monitor may request the following:

- additional data or other information required to accomplish the objectives of the monitoring plan



- request shall be accompanied by:
- ✓ an explanation of the need for such data
 - ✓ a specification of the form or format in which the data is to be produced, and,
 - ✓ an acknowledgment of the obligation of the market monitor to maintain the confidentiality of the data



This information includes:

- Production costs
- Opportunity costs
- Generating Logs
- Transmission Logs



Why we ALL do it!!

- Independent monitoring improves reliability and fairness
- Transparency ensures fair pricing
- The more watching, the better and more effective monitoring
- Keeps states from being “Balkanized”
- Opens markets/assures competitiveness