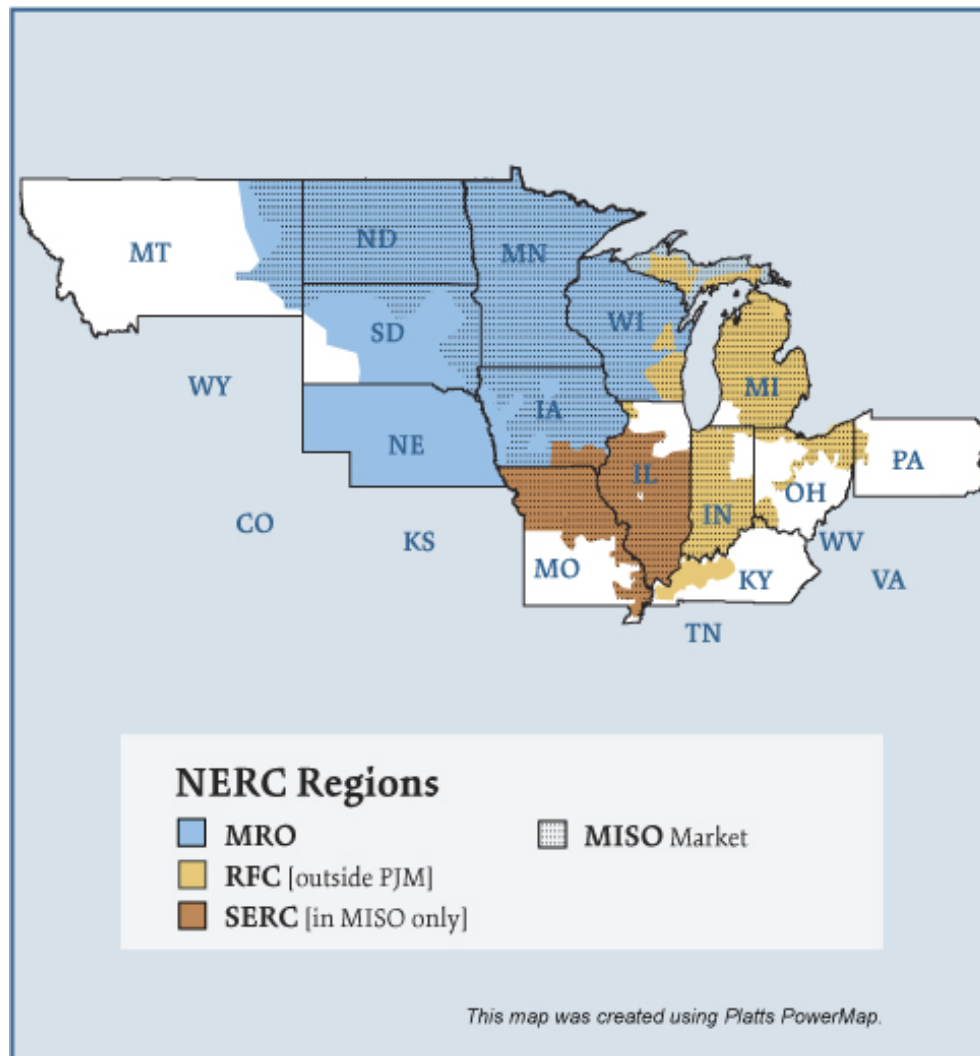


# Midwest Electric Regions



## Federal Energy Regulatory Commission • Market Oversight @ FERC.gov

## Overview

### Market Description

Midwest Reliability Organization (MRO) reliability region and the portion of the SERC reliability region in MISO and the ReliabilityFirst Corporation (RFC) reliability region not in PJM.

### Geography

States covered: All or most of North Dakota, South Dakota, Nebraska, Minnesota, Iowa, Wisconsin, Illinois, Indiana, Michigan and parts of Montana, Missouri, Kentucky, and Ohio.

Reliability regions: Midwest Reliability Organization (MRO), Southeastern Electric Reliability Council (SERC) and ReliabilityFirst Corporation (RFC)

(These regions were formerly: East Central Area Reliability Coordination Agreement (ECAR), Mid-America Interconnected Network (MAIN), and Midcontinent Area Power Pool (MAPP) regions.)

Balancing authorities: See list on page 6.

Hubs: Cinergy, First Energy, Illinois, Michigan, Minnesota

### RTO/ISO

Midwest ISO (MISO) (established 2002) administers a two-settlement (day ahead and real-time) energy market known as the Day-2 market. It produces hourly locational marginal prices that are rolled up into 5 regional hub prices. MISO also administers a monthly financial transmission rights (FTR) allocation and auction.

Midwest bilateral trading is active on the IntercontinentalExchange (ICE) at the Cinergy Hub and Northern Illinois Hub.

### [Midwest ISO 2006 State of the Markets Report](#)

Market Monitor: Dr. David Patton – Independent Market Monitor

**Federal Energy Regulatory Commission • Market Oversight @ FERC.gov****Generation/Supply (MISO only)**

Marginal fuel type: Coal

Generating capacity (summer 2006): 137,232 MW

Capacity reserve (summer 2006): 21,025 MW

Reserve margin (summer 2006): 18%

**Demand (MISO only)**

All time peak demand: 116 GW (set July 31, 2006)

All time peak demand for MISO market footprint excluding LG&E: 110.5 GW (set July 31, 2006)

In summer of 2006, demand reached record levels on several occasions due to extremely hot weather.

Peak demand growth: 3.4% (2005-2006)

Summer Peak Demand (GW): 112.2 (2005) 116 (2006) 110.5 (2006 MISO market footprint excluding LG&E)

*Source: Derived from MISO Data*

**Prices (MISO only)**

Annual Average Day-Ahead Price at Cinergy Hub: \$38.40/MWh (2005) \$40.48/MWh (2006) \$46.12/MWh (2007)

Prices increased in 2005 as a result of disturbances to the natural gas market. Prices declined in 2006 as natural gas storage levels remained above historical ranges throughout the injection season (April through October).

## Federal Energy Regulatory Commission • Market Oversight @ FERC.gov

**Interconnections/Seams**

Since the start of the Day-2 market on April 1, 2005, persistent transmission constraints in the Wisconsin and the Upper Peninsula of Michigan (WUMS) and Minnesota areas have caused their prices to diverge from other areas of MISO, usually at times of high loads or decreased generation supply.

**Focal Points**

**Day-2 Operations:** The Midwest Independent System Operator (MISO) started Day-2 market operations on April 1, 2005. This is the date that real-time market operations began and MISO began centrally dispatching wholesale electricity and transmission service throughout much of the Midwest. The market produces Locational Marginal Prices (LMP) for five-minute intervals at numerous locations throughout the MISO market footprint. These prices are aggregated into five hub prices that provide participants with price indices. These regional pricing points are the Minnesota, Michigan, Illinois, Cinergy and First Energy hubs. LMP and hub prices give participants better market information than was previously available.

**Minnesota Price Volatility:** Minnesota hub prices have been volatile over the past year, at times moving significantly above or below other MISO hubs. Possible contributing factors were long-term generator outages and derates due to maintenance, a supply of large baseload units, higher than expected summer temperatures, and decreased imports into the Minnesota region.

## Focal Points

**LG&E, KU withdraw:** On September 1, 2006 Louisville Gas & Electric (LG&E) and Kentucky Utilities Company (KU) withdrew from MISO. These entities are owned by E.ON U.S. and are now considered Non-Transmission Owning Members of MISO. The withdrawal effectively removed their assets (load, generation and transmission lines) from MISO dispatch and control. The Kentucky Public Service Commission approved the Tennessee Valley Authority (TVA) to be their Reliability Coordinator and the Southwest Power Pool (SPP) to be their independent transmission organization. LG&E and KU engage in market transactions in MISO as any other Non-Transmission Owning Member. MISO no longer produces Locational Marginal Prices for any LG&E or KU points.

**Electric Regions Combine:** Three former electric reliability councils combined to form the Reliability First Corp. (RFC). RFC, after being approved as the regional council by the North American Electric Reliability Council, began operation on Jan. 1, 2006. The new region spans an area from the Mid-Atlantic across the Midwest, including parts of Wisconsin and Illinois. The three former councils that combined to form RFC are the East Central Area Reliability Council (ECAR), the Mid-Atlantic Area Council (MAAC), and the Mid-America Interconnected Network (MAIN). The RFC serves part of the territory of two RTOs, the PJM Interconnection and Midwest ISO.

## Supply and Demand Statistics for MISO

<b>Supply Demand Statistics</b>			
	2004 (2)	2005	2006 (1)
Summer Generating Capacity MW	NA	136,402	137,232
Summer Peak Demand MW	101,538	112,197	116,207
Summer Reserves MW	NA	24,205	21,025
Summer Reserve Margin:	NA	22%	18%
Annual Load (GWh):	569,475	607,474	NA
Annual Net Generation GWh	NA	NA	NA

Footnote (2)/ The MISO Day-2 market did not exist in the summer of 2004

Footnote (1)/ This includes LG&E and KU. LG&E and KU left the MISO market on 9/1/2006

Source: Derived from *MISO* data and FERC staff discussions with MISO.

Updated January 8, 2007

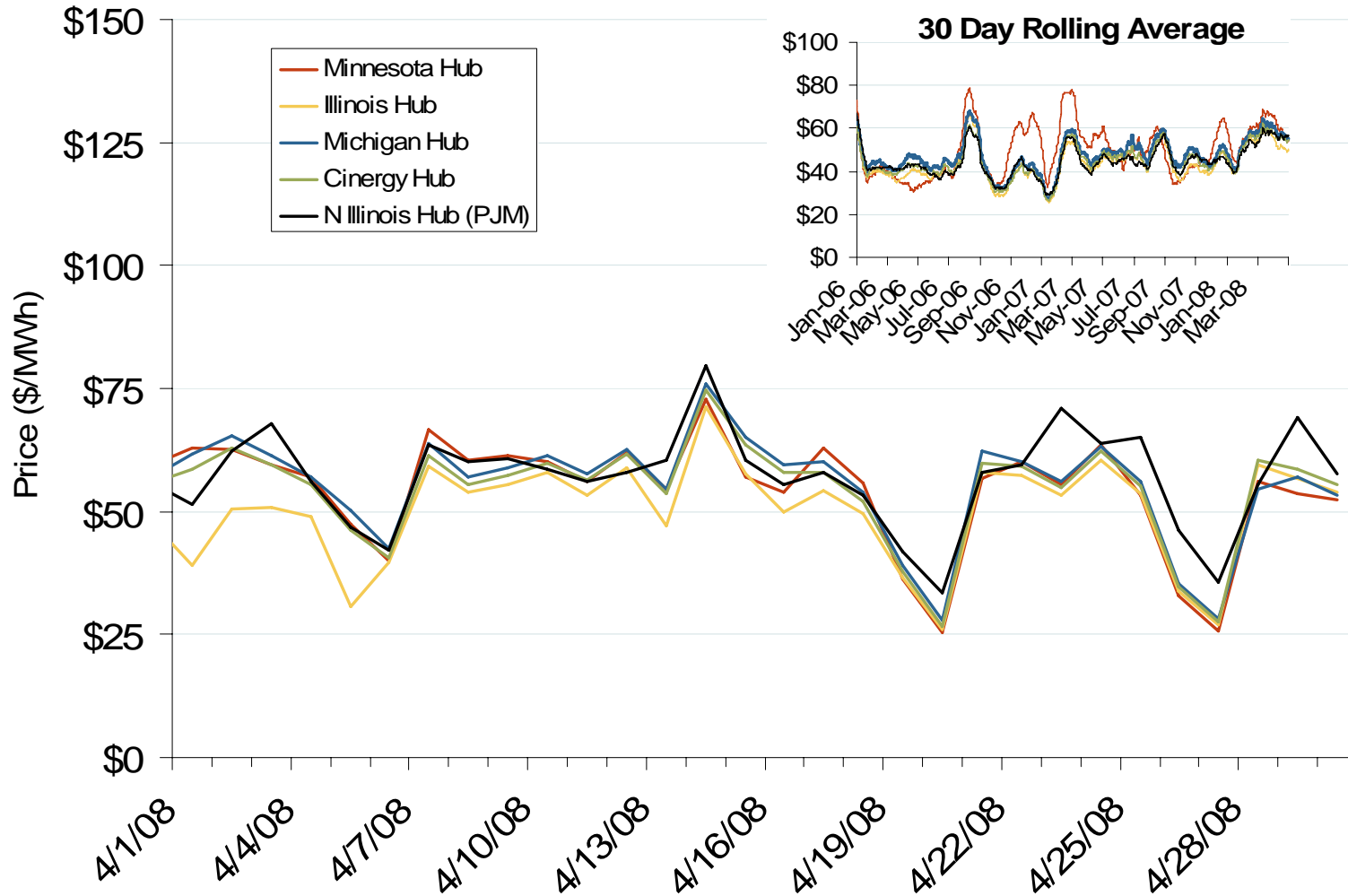
1011

## Annual Average Bilateral Prices

Annual Average Day Ahead On Peak Prices (\$/MWh)				
	2005	2006	2007	5 Years
Cinergy	\$63.76	\$51.81	\$61.20	\$51.50
Michigan Hub*	\$72.79	\$55.29	\$64.43	\$63.38
Minnesota Hub*	\$69.25	\$59.47	\$72.32	\$66.81
NI Hub	\$61.76	\$52.52	\$58.93	\$50.45
Illinois Hub*	\$67.92	\$51.32	\$59.88	\$58.96
MAPP South	\$65.48	\$55.11	\$61.18	\$54.16

\* As of April 1, 2005.

## Daily Average of MISO Day-Ahead Prices - All Hours

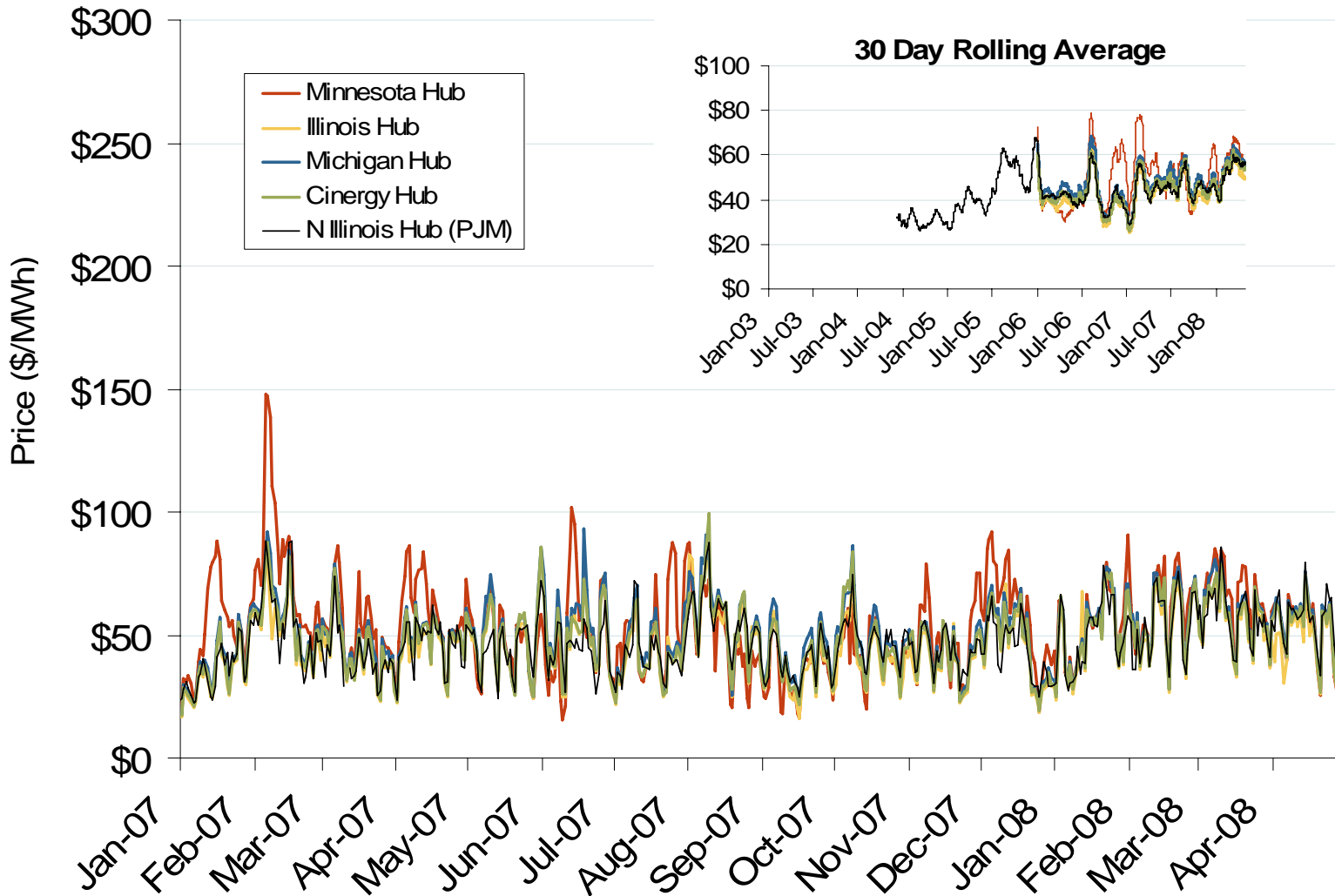


Source: Derived by Bloomberg from MISO and PJM data as reported by Bloomberg.

Updated May 6, 2008 1128



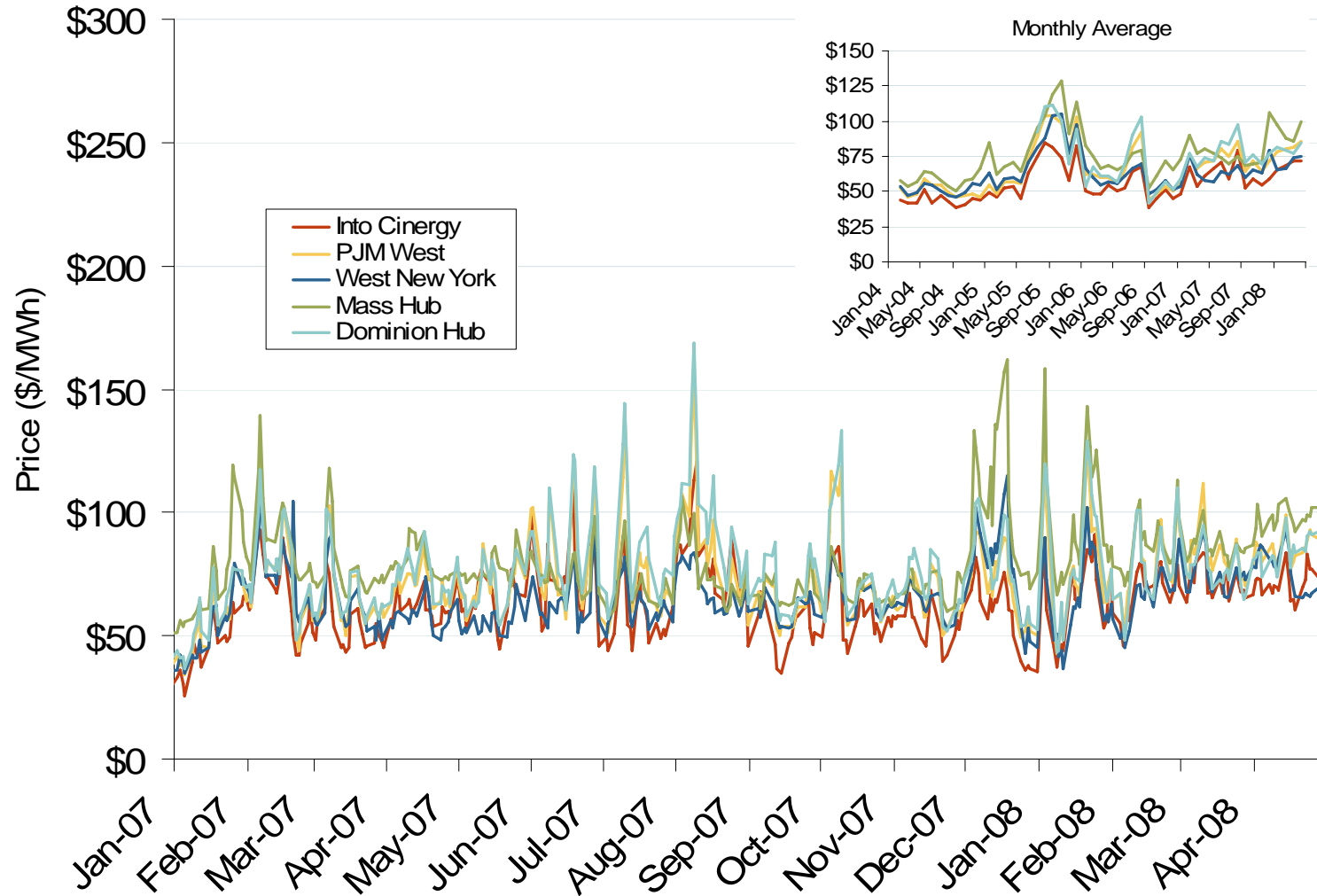
## Daily Average of MISO Day-Ahead Prices - All Hours



Source: Derived by Bloomberg from MISO and PJM data as reported by Bloomberg.

Updated May 6, 2008

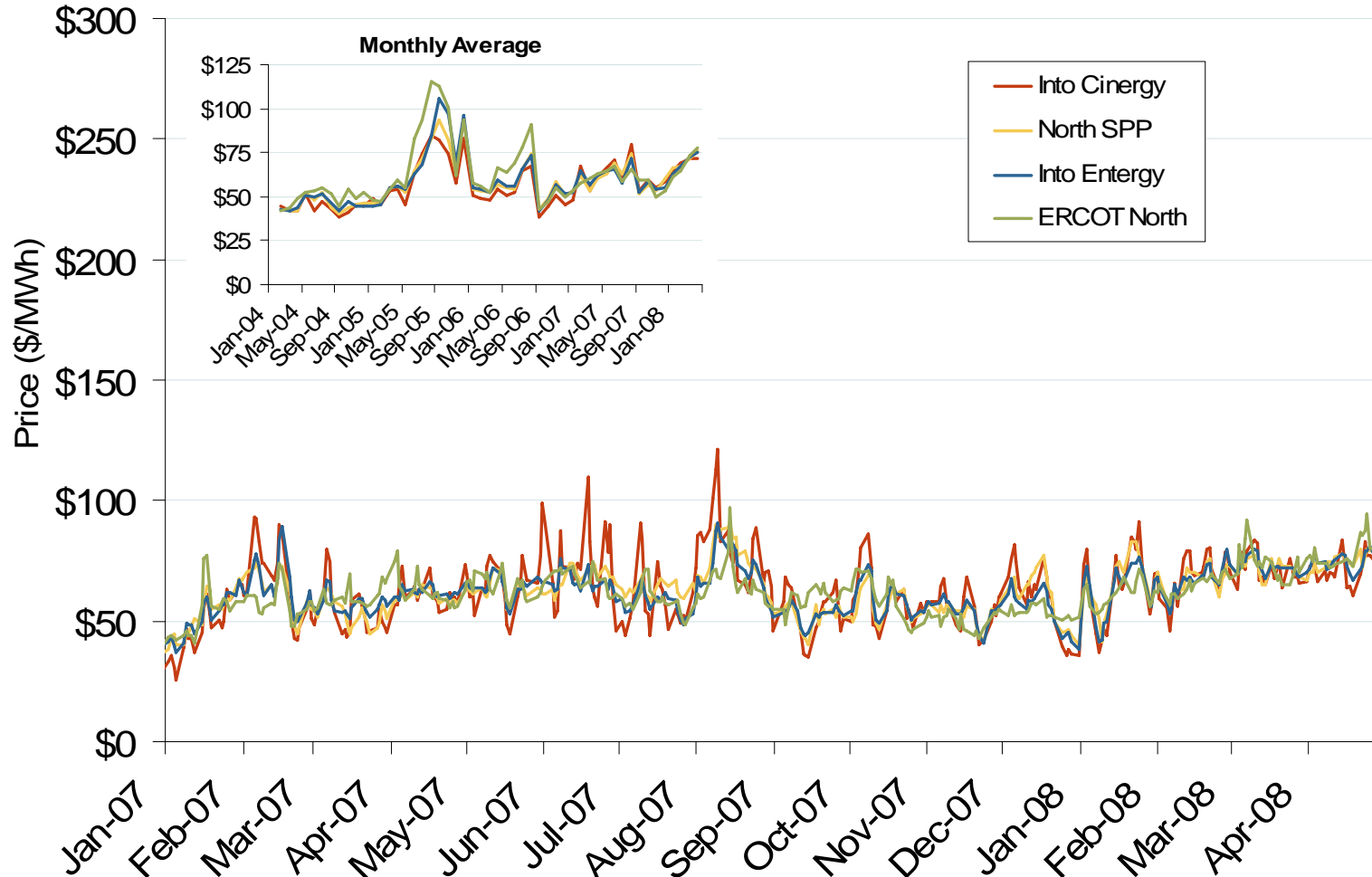
## Eastern Daily Bilateral Day-Ahead On-Peak Prices



Source: Derived from Platts data.

Updated May 6, 2008  
1014

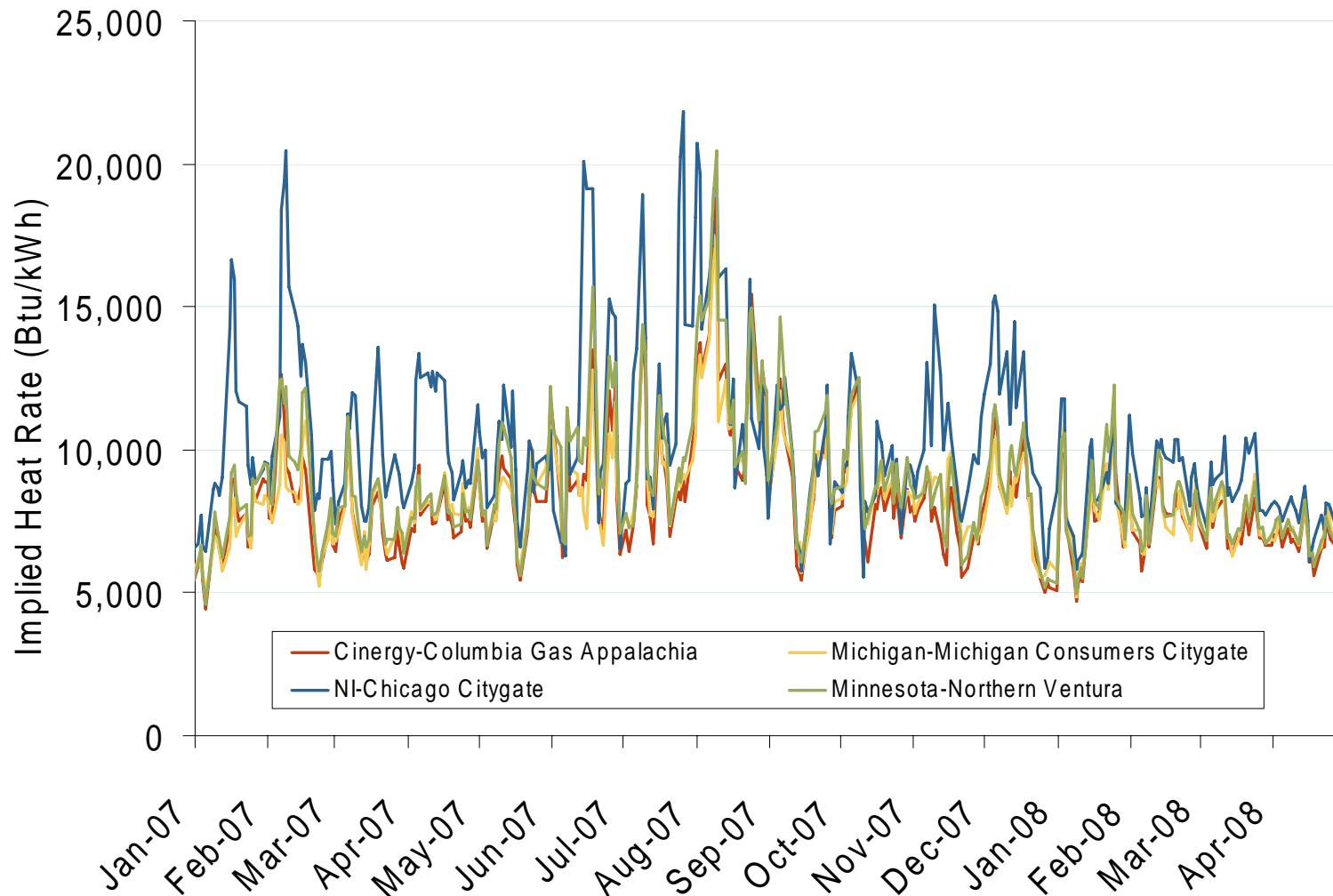
# Midwestern Daily Bilateral Day-Ahead On-Peak Prices



Source: Derived from Platts data

Updated May 6, 2008  
1015

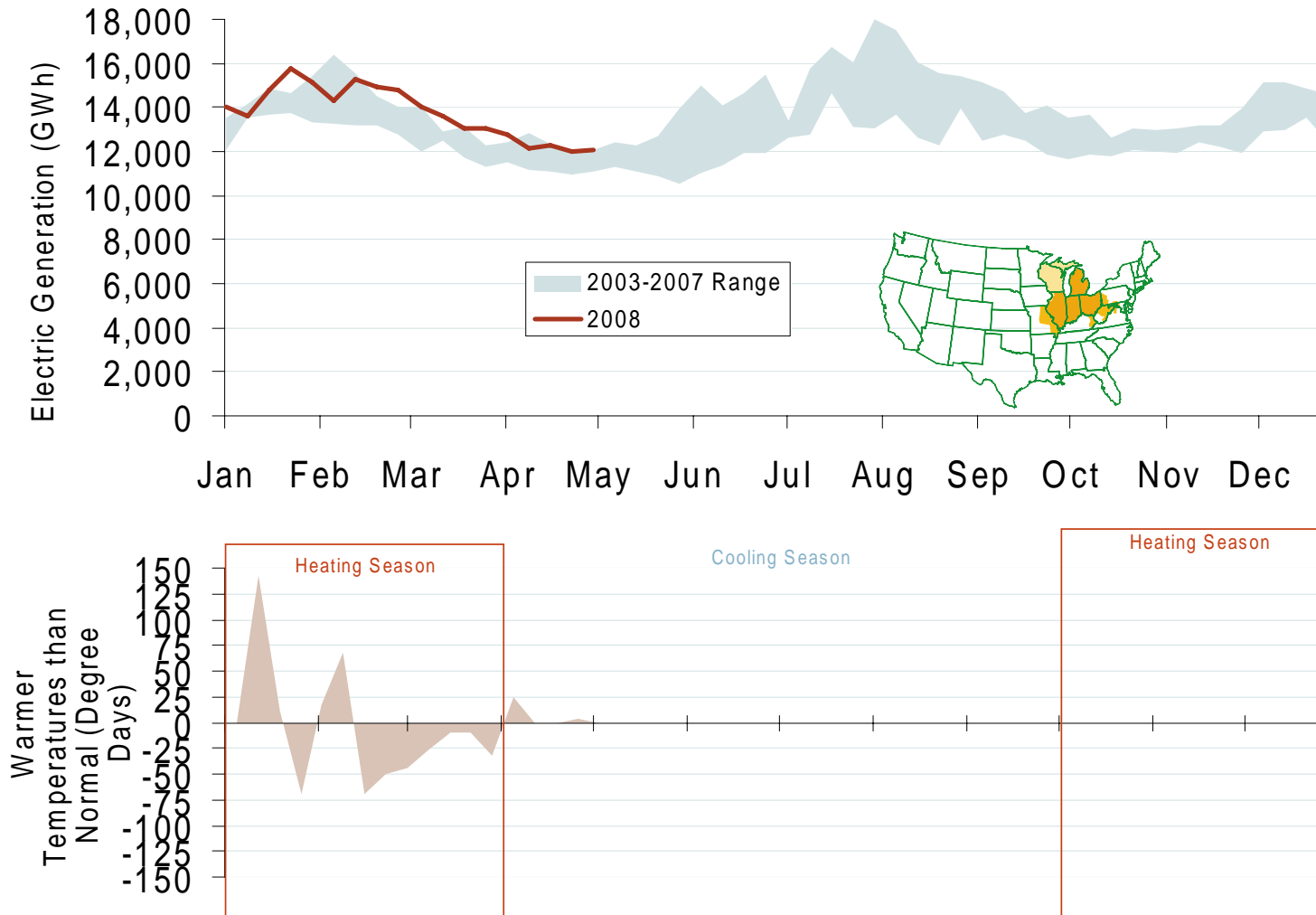
## Implied Heat Rates at MISO Hubs



Source: Derived from *Platts* data

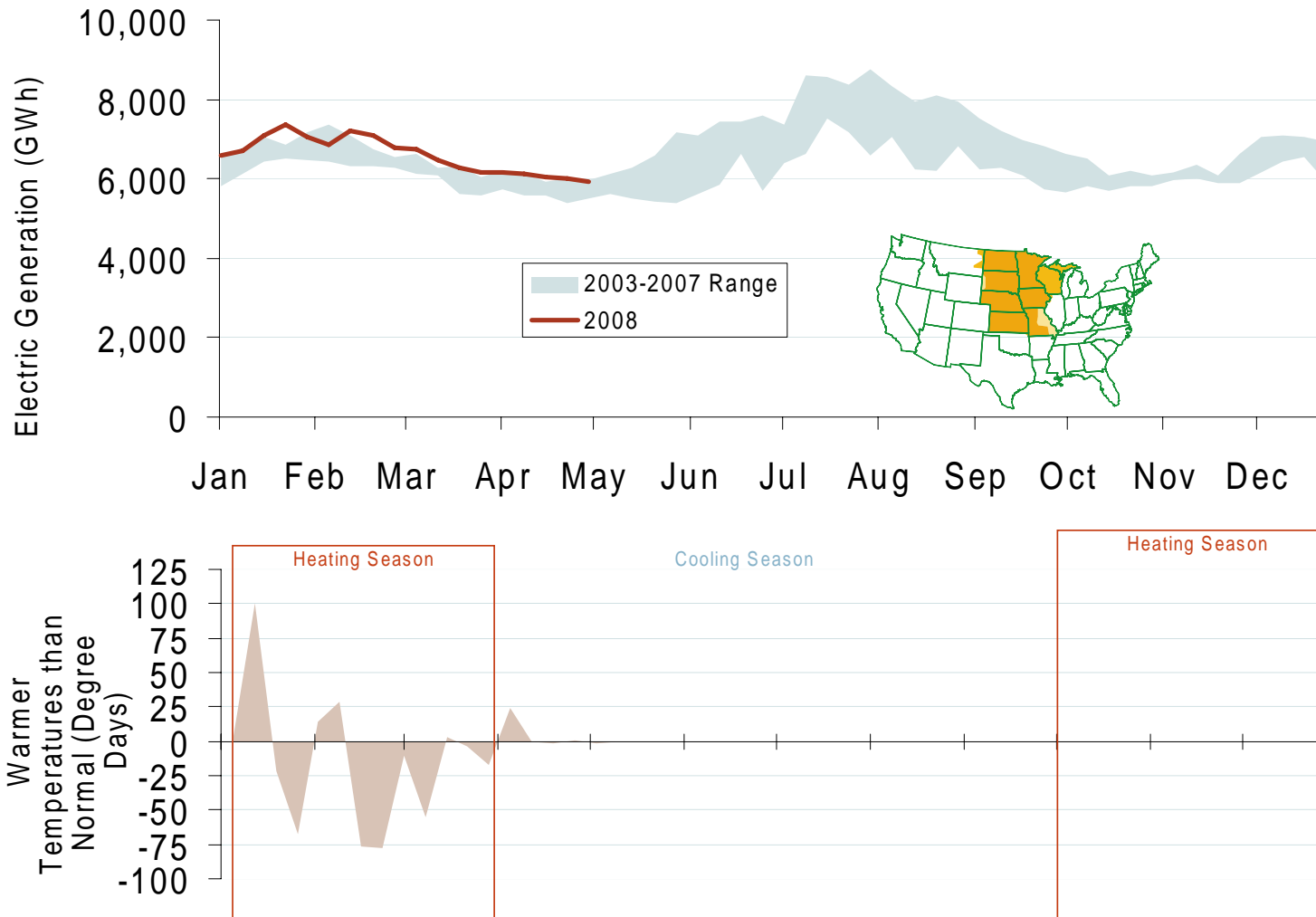
Updated May 6, 2008

# Weekly Electric Generation Output and Temperatures Central Industrial Region



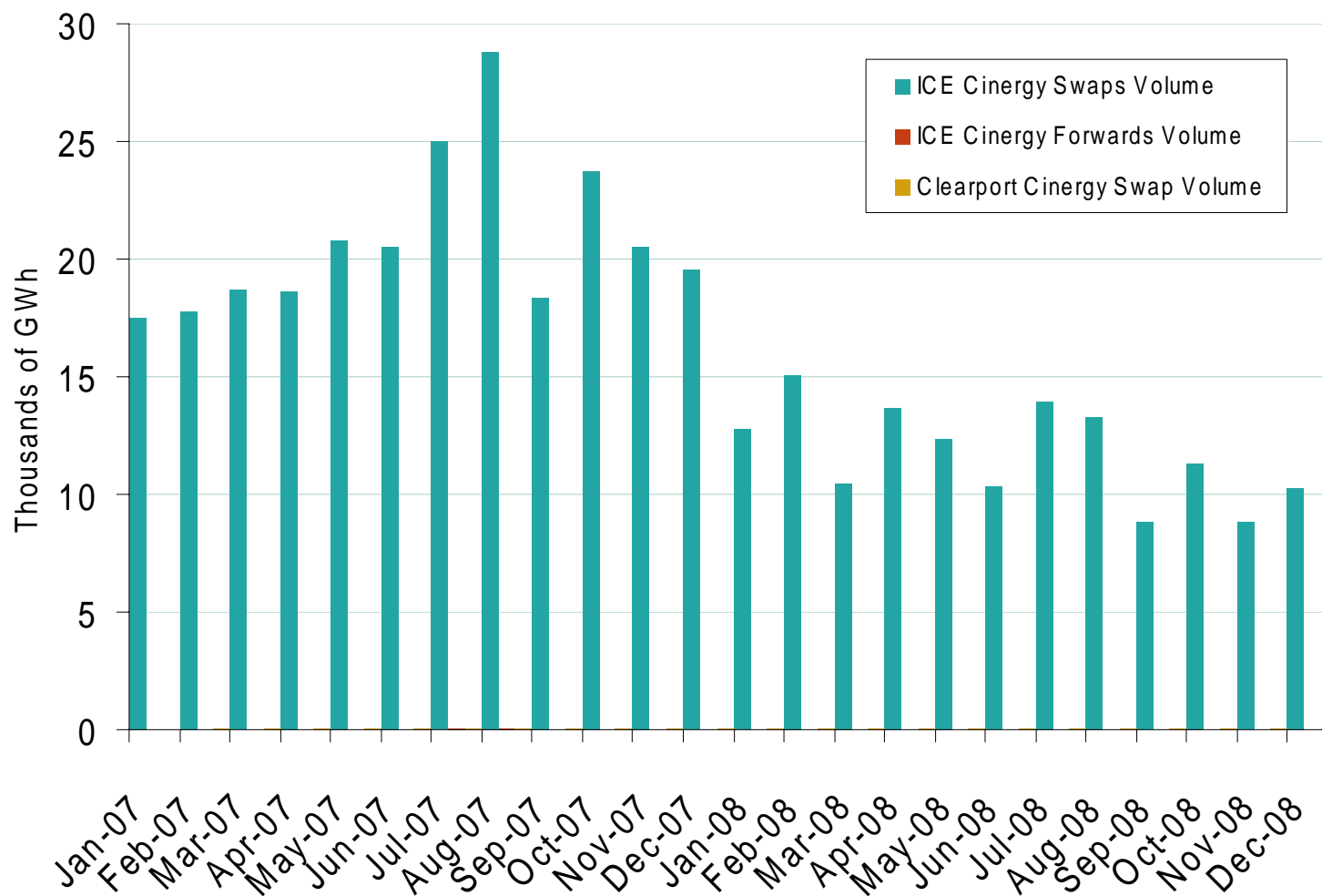
Source: Derived from EEI and NOAA data.

# Weekly Electric Generation Output and Temperatures West Central Region



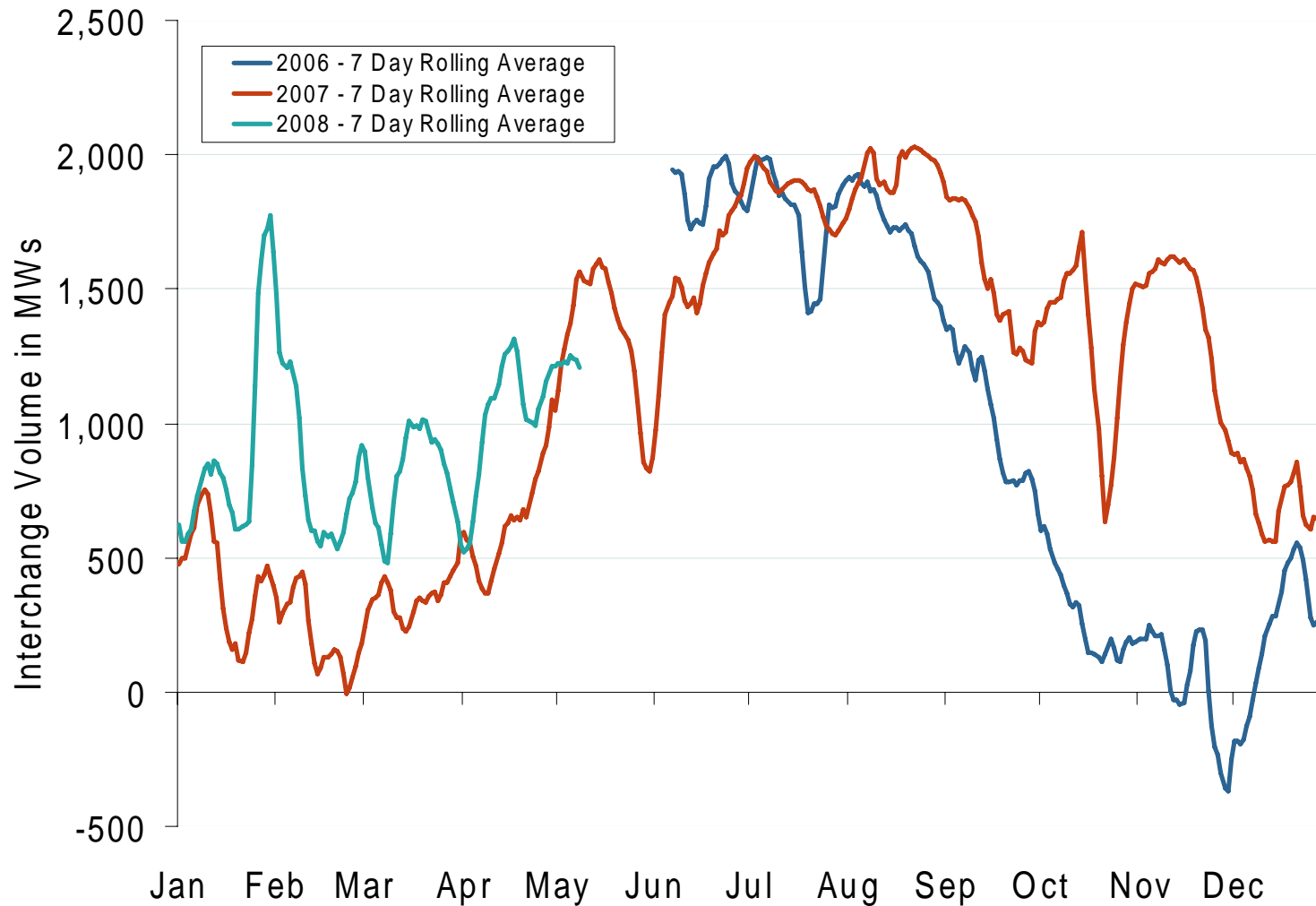
Source: Derived from EEI and NOAA data.

## Cinergy Forward and Swap Volumes



Source: Derived from ICE and Nymex ClearPort data. ICE on-peak forward (physical) and swap (financial) volumes are for the Cinergy Hub and include monthly, dual monthly, quarterly, and calendar year contracts traded for each month. Nymex ClearPort on-peak swaps (financial) volume are for the Cinergy Hub traded by month.

## Imports into MISO from Manitoba Hydro 2006, 2007, 2008



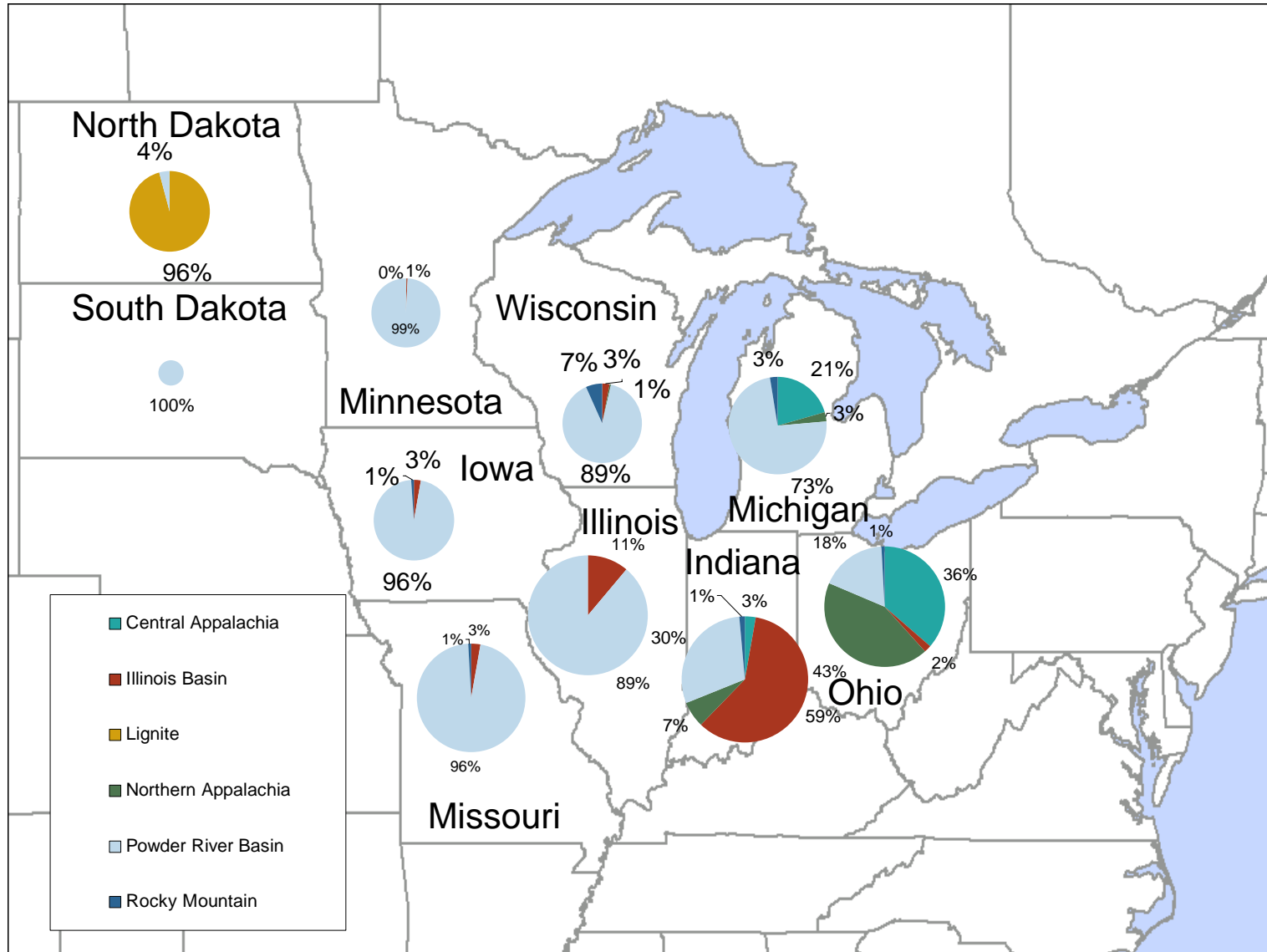
Source: Derived from MISO data.

Updated May 6, 2008

1135



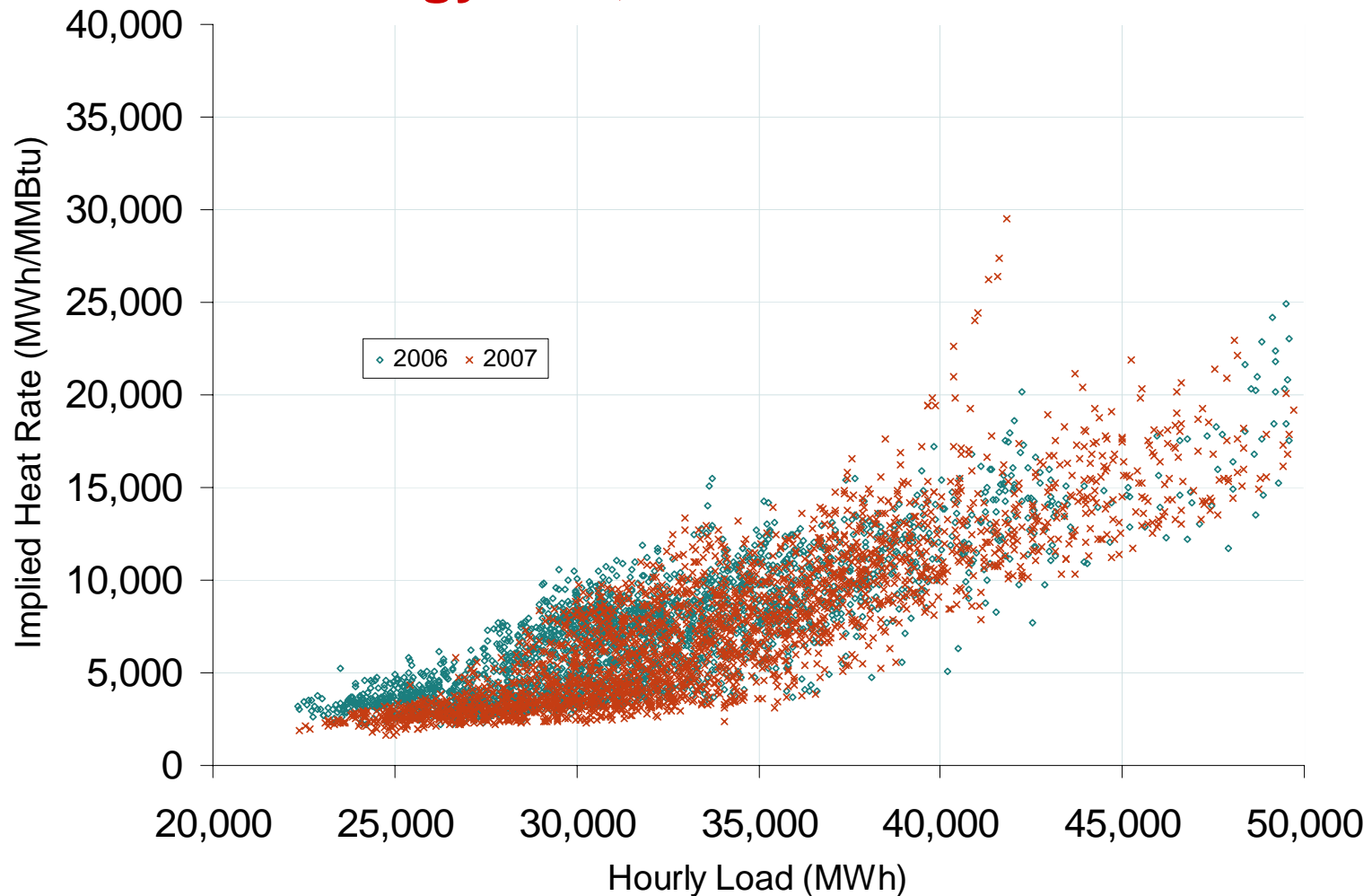
## 2007 Coal Shipment Origins by Supply Basin



Source: Derived from FERC and EIA data.

Created March 7, 2007

## Hourly Implied Heat Rates for Electric Power Prices at Cinergy Hub, Summer 2006-2007



Note: Implied Heat Rate equals hourly day-ahead price of electric power in \$/MWh at the Cinergy Hub divided by the daily price of natural gas in \$/MMBtu at the Columbia Gas Appalachia Hub. Hourly load is for MISO East.

Source: Derived from *Platts* data

Updated November 5, 2007

## Hourly Implied Heat Rates for Electric Power Prices at Illinois Hub, Summer 2006-2007



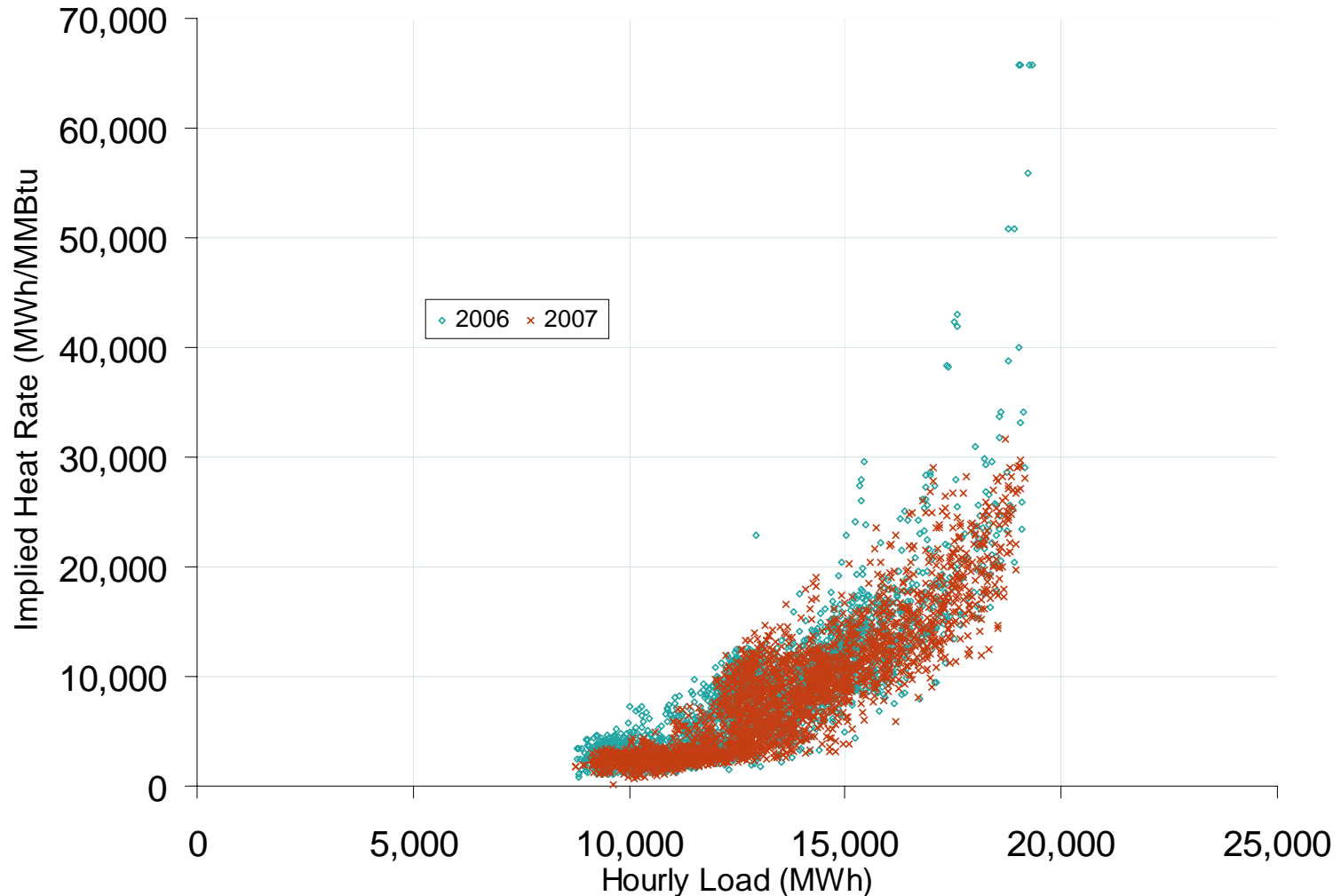
Note: Implied Heat Rate equals hourly day-ahead price of electric power in \$/MWh at the Illinois Hub divided by the daily price of natural gas in \$/MMBtu at the Chicago Citygates. Hourly load is for MISO Central.

Source: Derived from *Platts* data

Updated November 5, 2007

1155

## Hourly Implied Heat Rates for Electric Power Prices at Minnesota Hub, Summer 2006-2007

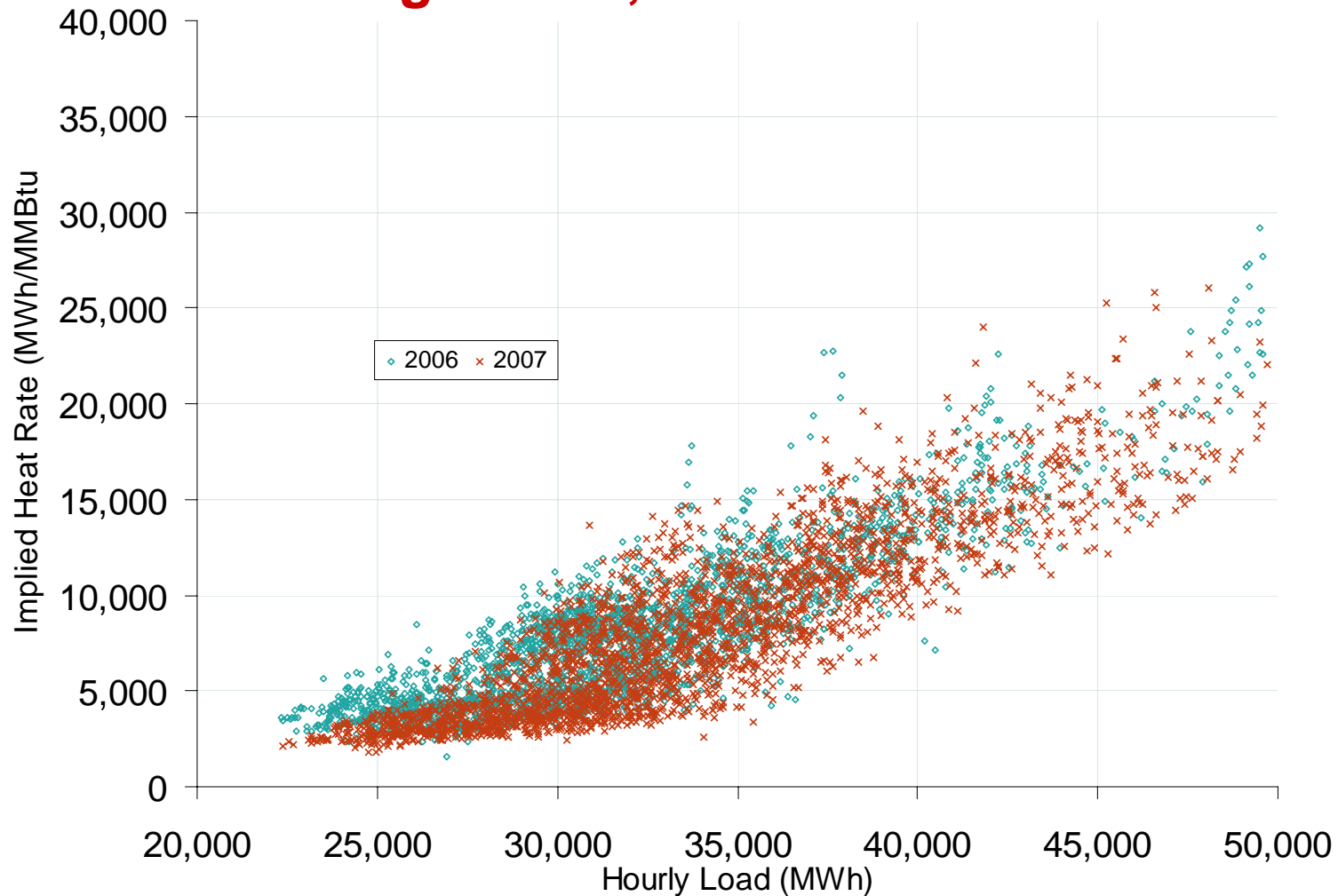


Note: Implied Heat Rate equals hourly day-ahead price of electric power in \$/MWh at the Minnesota Hub divided by the daily price of natural gas in \$/MMBtu at the Northern Ventura Hub. Hourly load is for MISO West.

Source: Derived from *Platts* data

Updated November 5, 2007

## Hourly Implied Heat Rates for Electric Power Prices at Michigan Hub, Summer 2006-2007



Note: Implied Heat Rate equals hourly day-ahead price of electric power in \$/MWh at the Michigan Hub divided by the daily price of natural gas in \$/MMBtu at the Michigan Consumers Citygate. Hourly load is for MISO East.

Source: Derived from *Platts* data

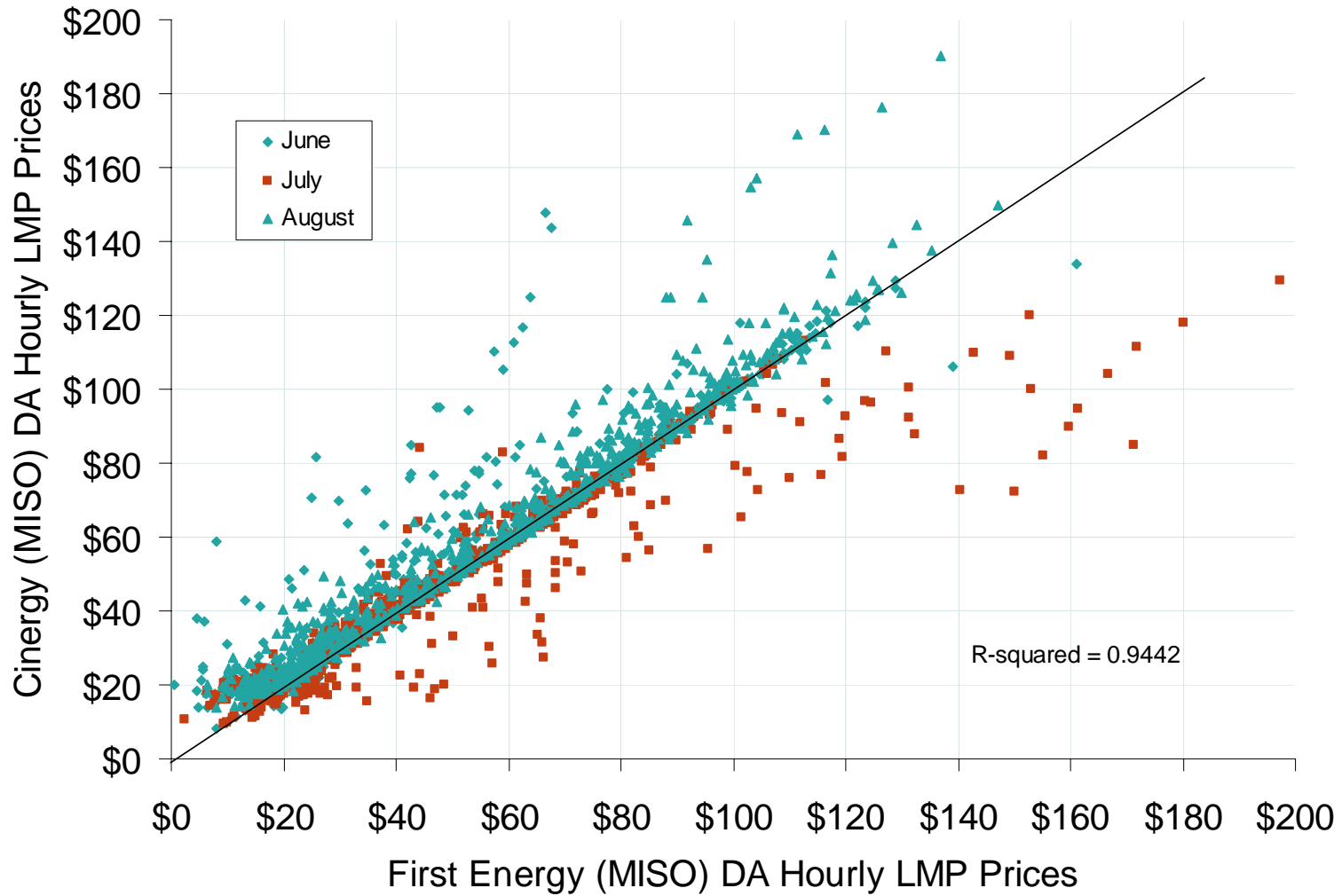
Updated November 5, 2007

1155



# RTO/ISO Seams Issues

## Hourly Day-Ahead Prices at Cinergy Hub (MISO) and First Energy Hub (MISO) June 1-August 31, 2007



Source: Derived from MISO data.

Created December 7, 2007

1134

## Hourly Day-Ahead Prices at Cinergy (MISO) and ComEd (PJM) June 1-August 31, 2007



Source: Derived from MISO and PJM data.

Created December 7, 2007

1134



## Hourly Day-Ahead Prices at Cinergy (MISO) and AEP (PJM) June 1-August 31, 2007

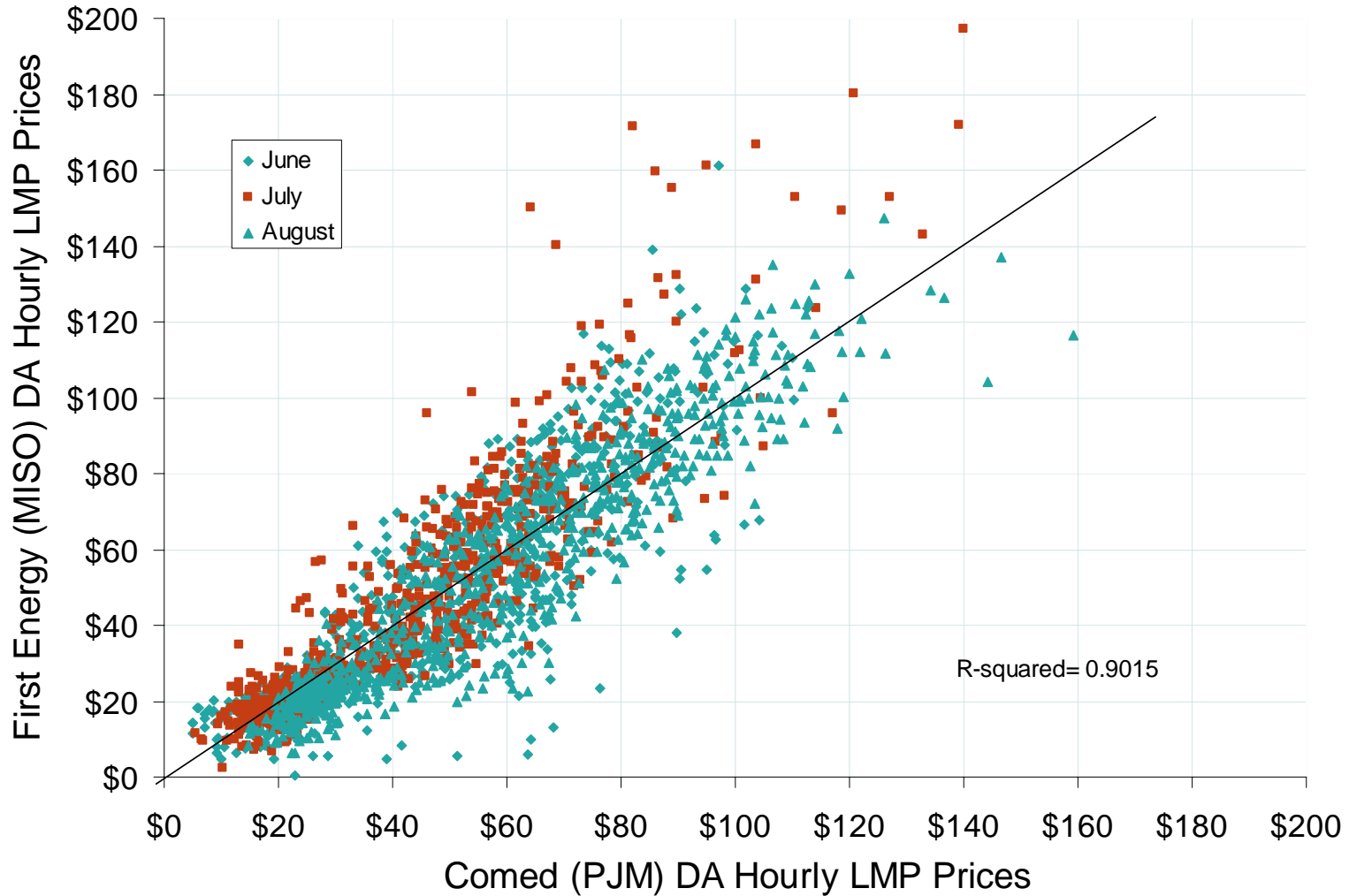


Source: Derived from *MISO* and *PJM* data.

Created December 7, 2007

1134

# Hourly Day-Ahead Prices at First Energy Hub (MISO) and ComEd (PJM) June 1-August 31, 2007



Source: Derived from MISO and PJM data.

Created December 7, 2007

1134

## Hourly Day-Ahead Prices at First Energy Hub (MISO) and AEP (PJM) June 1-August 31, 2007

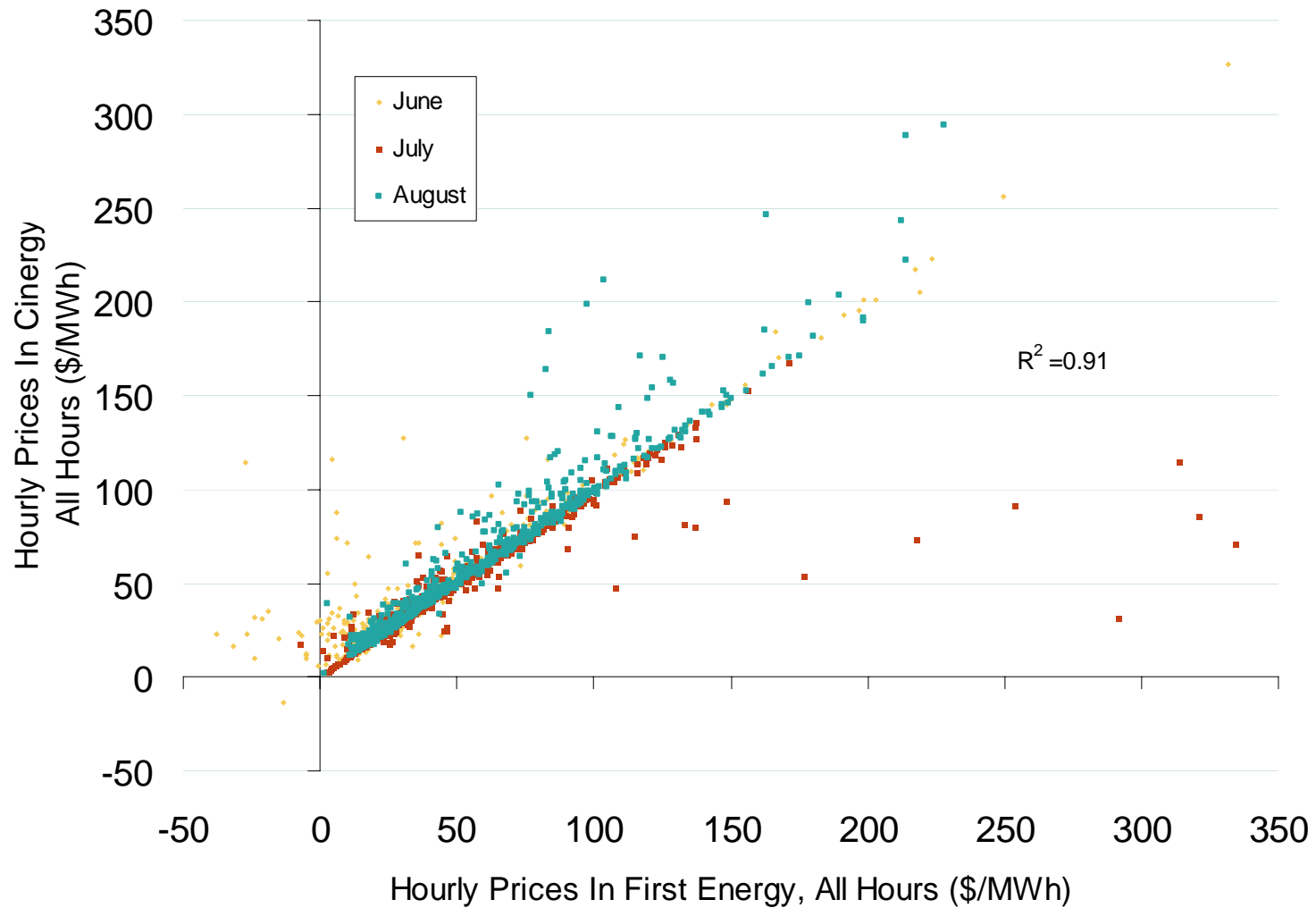


Source: Derived from MISO and PJM data.

Created December 7, 2007

1134

## Hourly Real-Time Prices at Cinergy Hub (MISO) and First Energy Hub (MISO) June 1-August 31, 2007

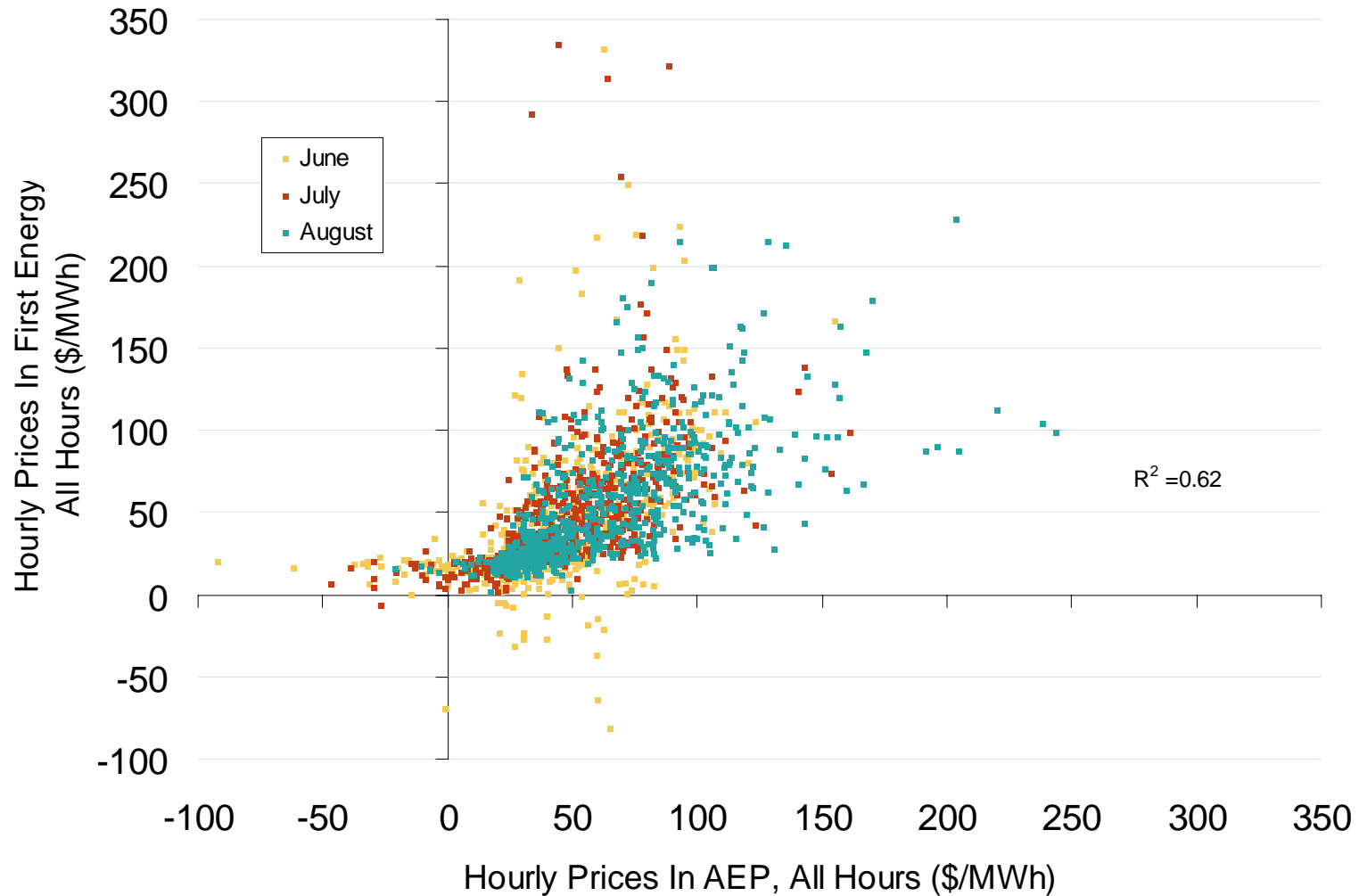


Source: Derived from MISO data.

Created October 5, 2007

1134

## Hourly Real-Time Prices at First Energy Hub (MISO) and AEP (PJM) June 1-August 31, 2007

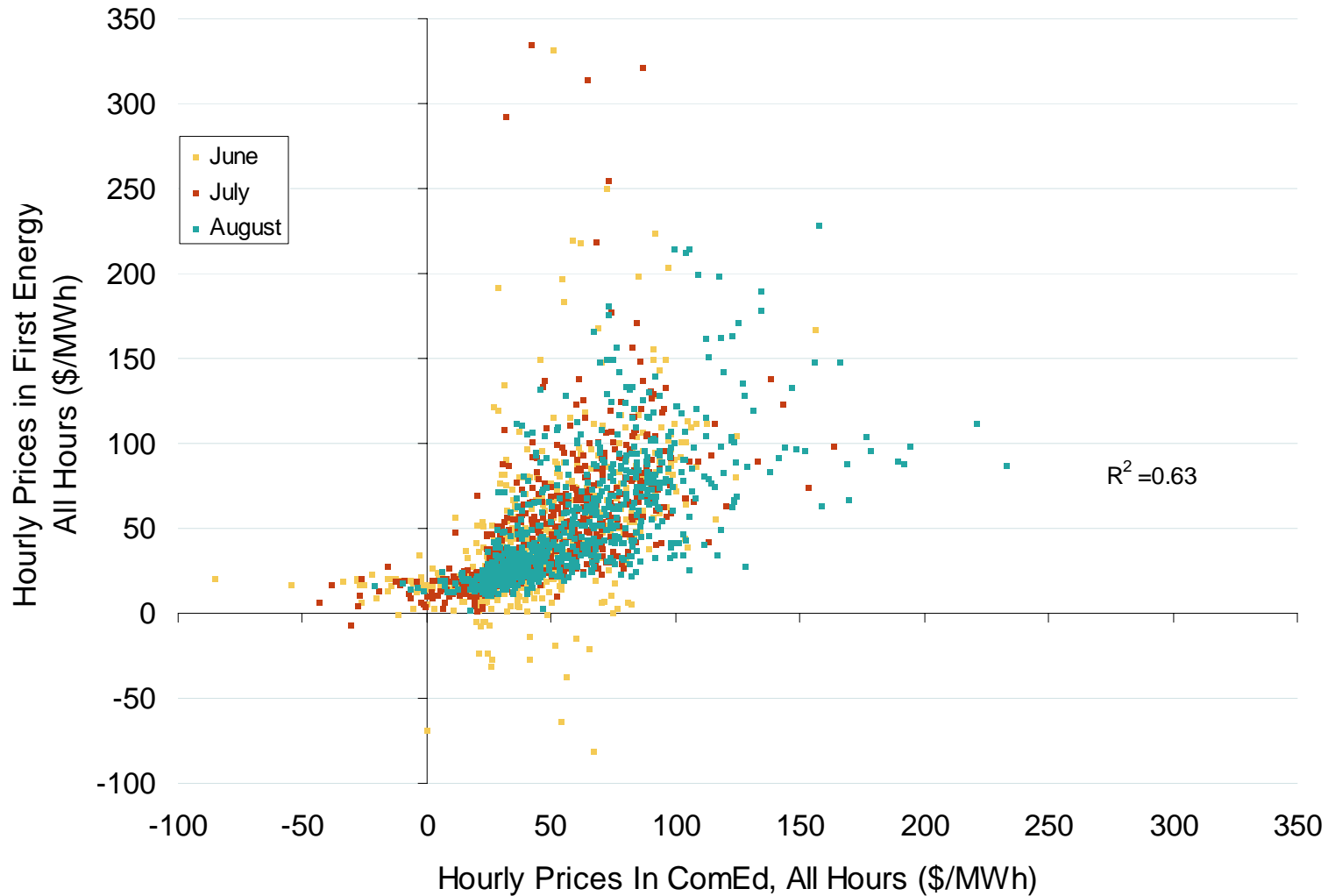


Source: Derived from MISO and PJM data.

Created October 5, 2007

1134

## Hourly Real-Time Prices at First Energy Hub (MISO) and ComEd (PJM) June 1-August 31, 2007

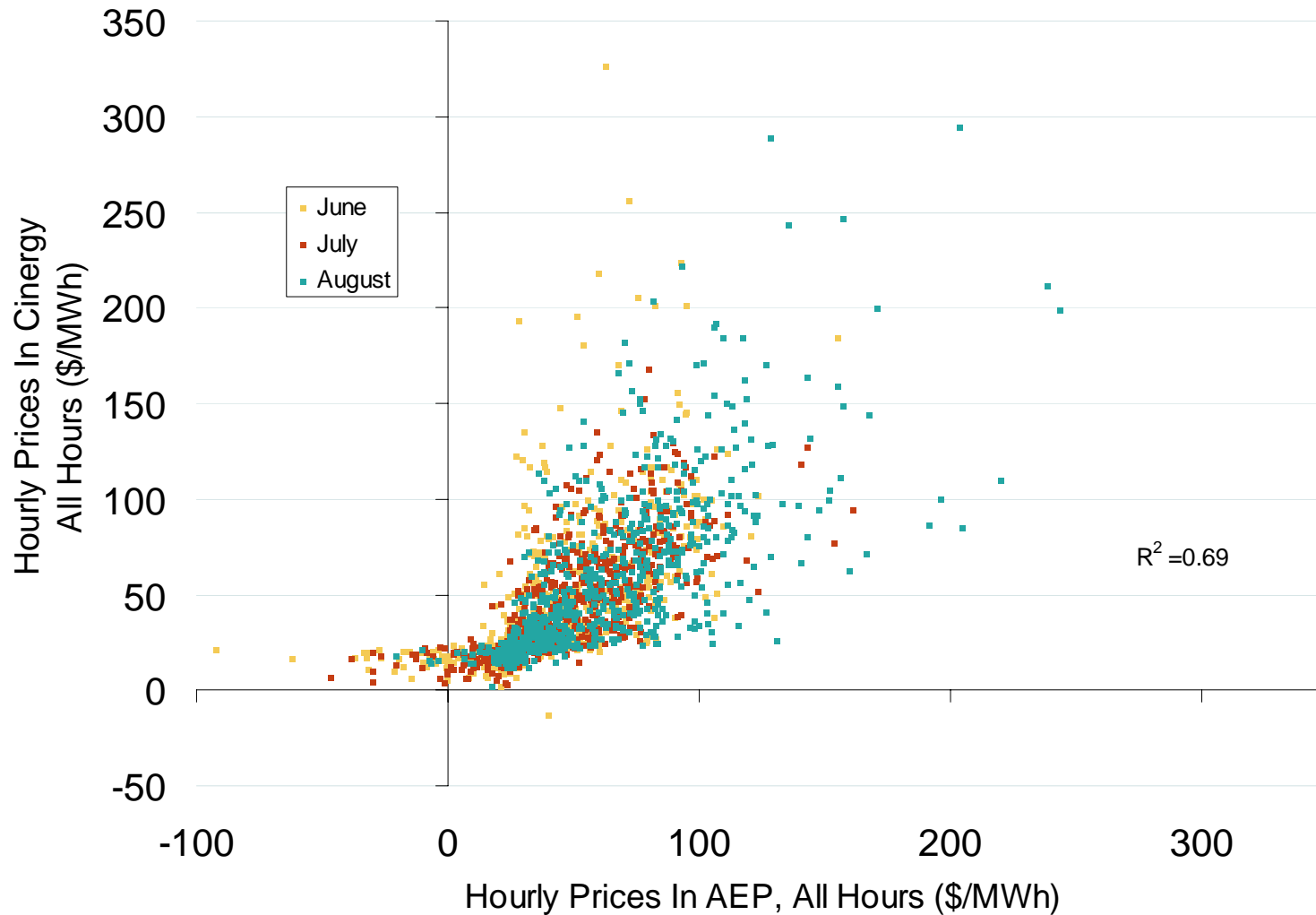


Source: Derived from MISO and PJM data.

Created October 5, 2007

1134

## Hourly Real-Time Prices at Cinergy (MISO) and AEP (PJM) June 1-August 31, 2007

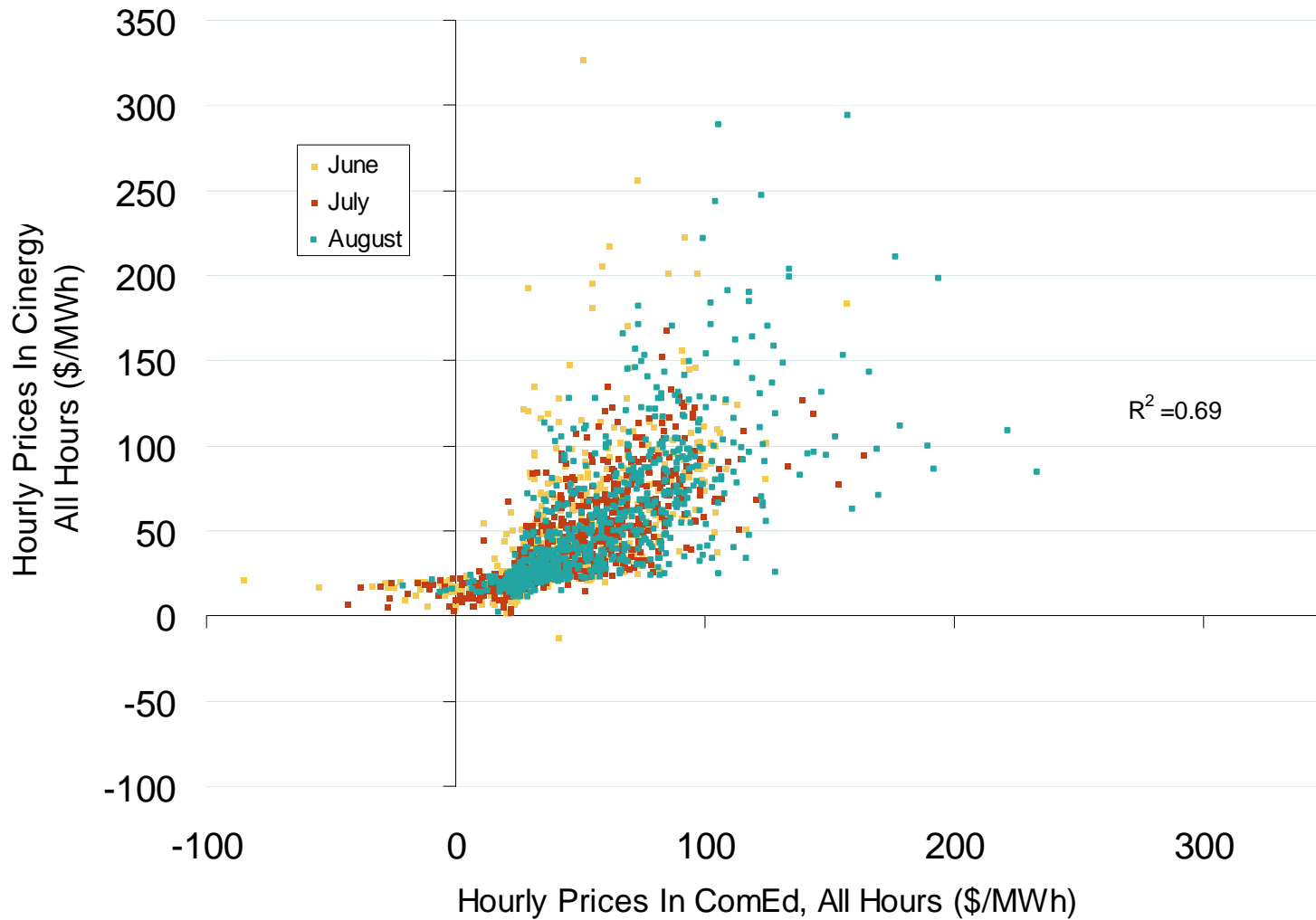


Source: Derived from MISO and PJM data.

Created October 5, 2007

1134

## Hourly Real-Time Prices at Cinergy (MISO) and ComEd (PJM) June 1-August 31, 2007



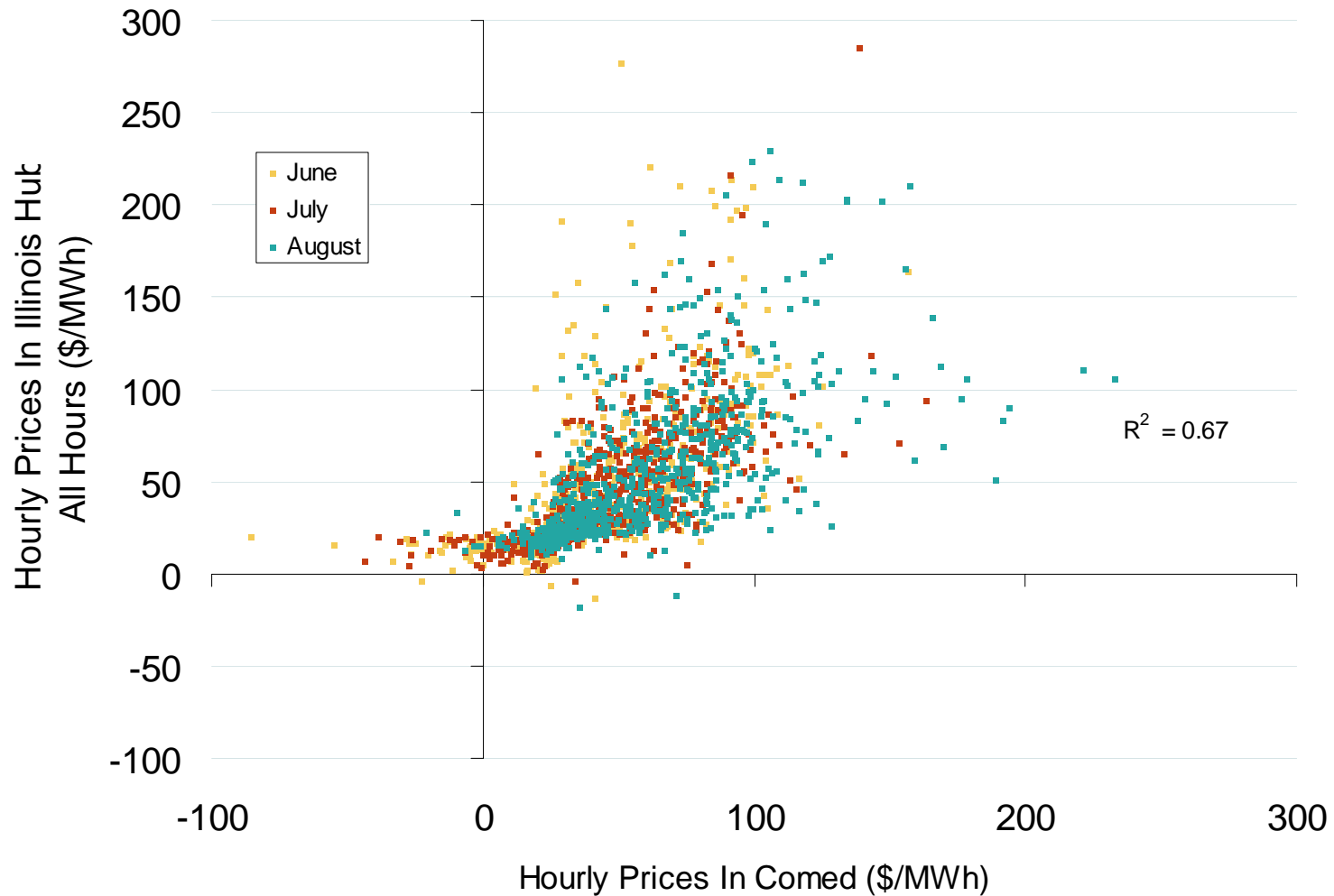
Source: Derived from MISO and PJM data.

Created October 5, 2007

1134



## Hourly Real-Time Prices at Illinois Hub (MISO) and ComEd (PJM) June 1-August 31, 2007

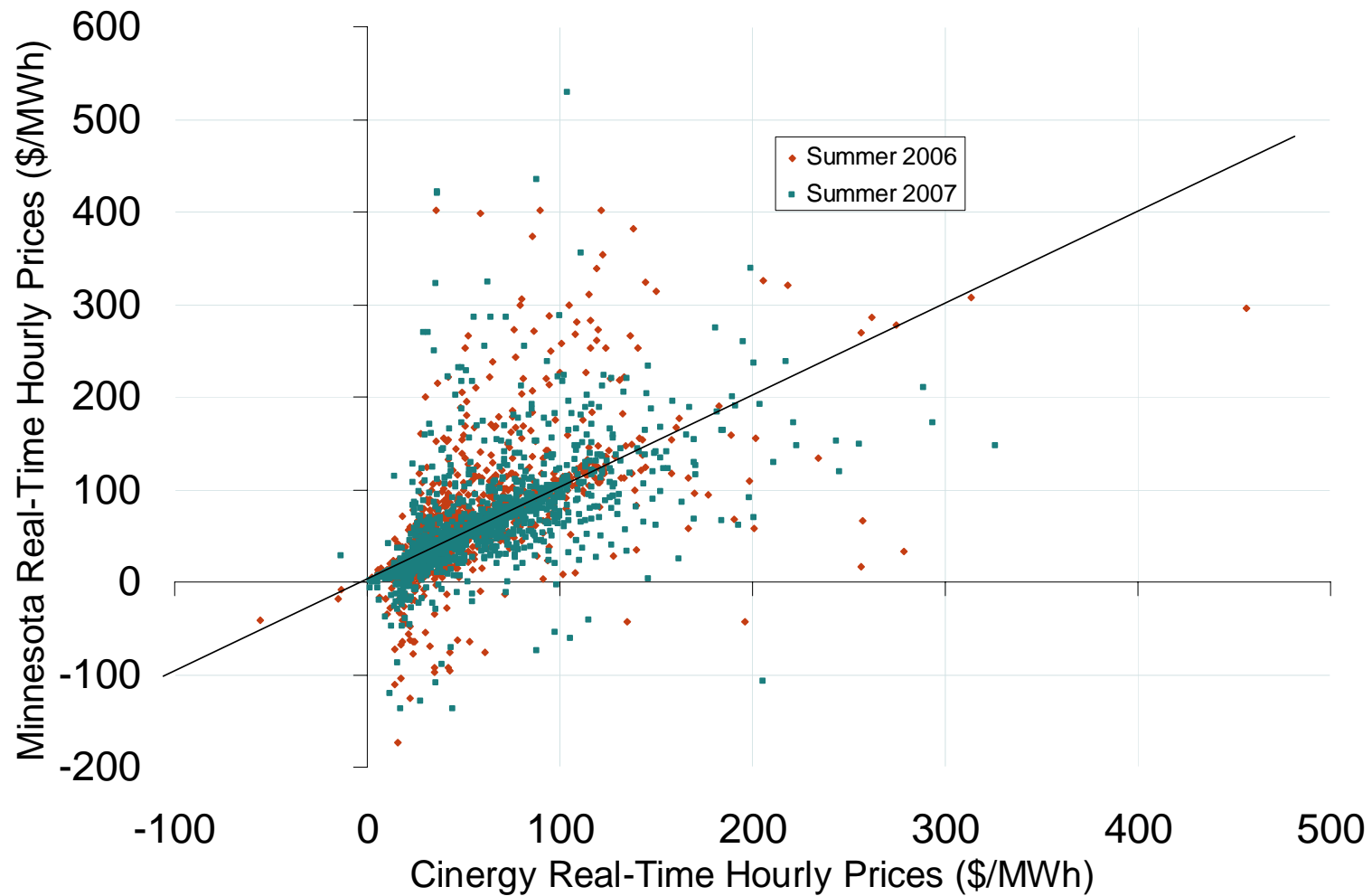


Source: Derived from MISO and PJM data.

Created October 5, 2007

1134

## Hourly Real-Time Prices at Minnesota Hub and Cinergy Hub Summer 2006 and 2007 (June to August)

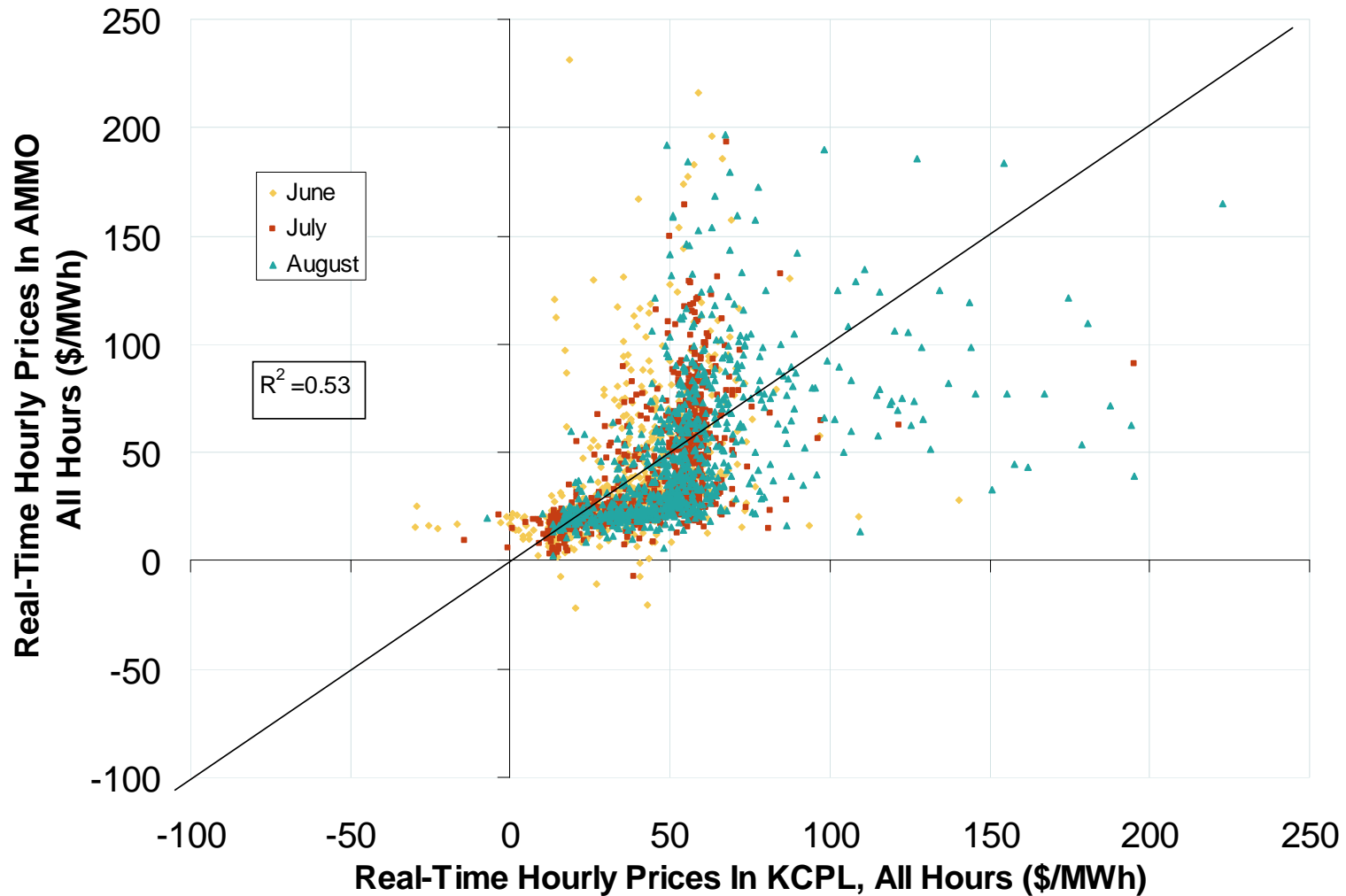


Source: Derived from MISO data.

Created November 5, 2007

1134

## Hourly Real-Time Prices at Ameren (MO) and Kansas City Power & Light June 1-August 31, 2007 (All Points)



Source: Derived from MISO and SPP data.

Created November 5, 2007

1134