

Overview of Day Ahead HOEP Forecast Model

Nash Peerbocus
Senior Economist
Market Evolution, Analysis and Research

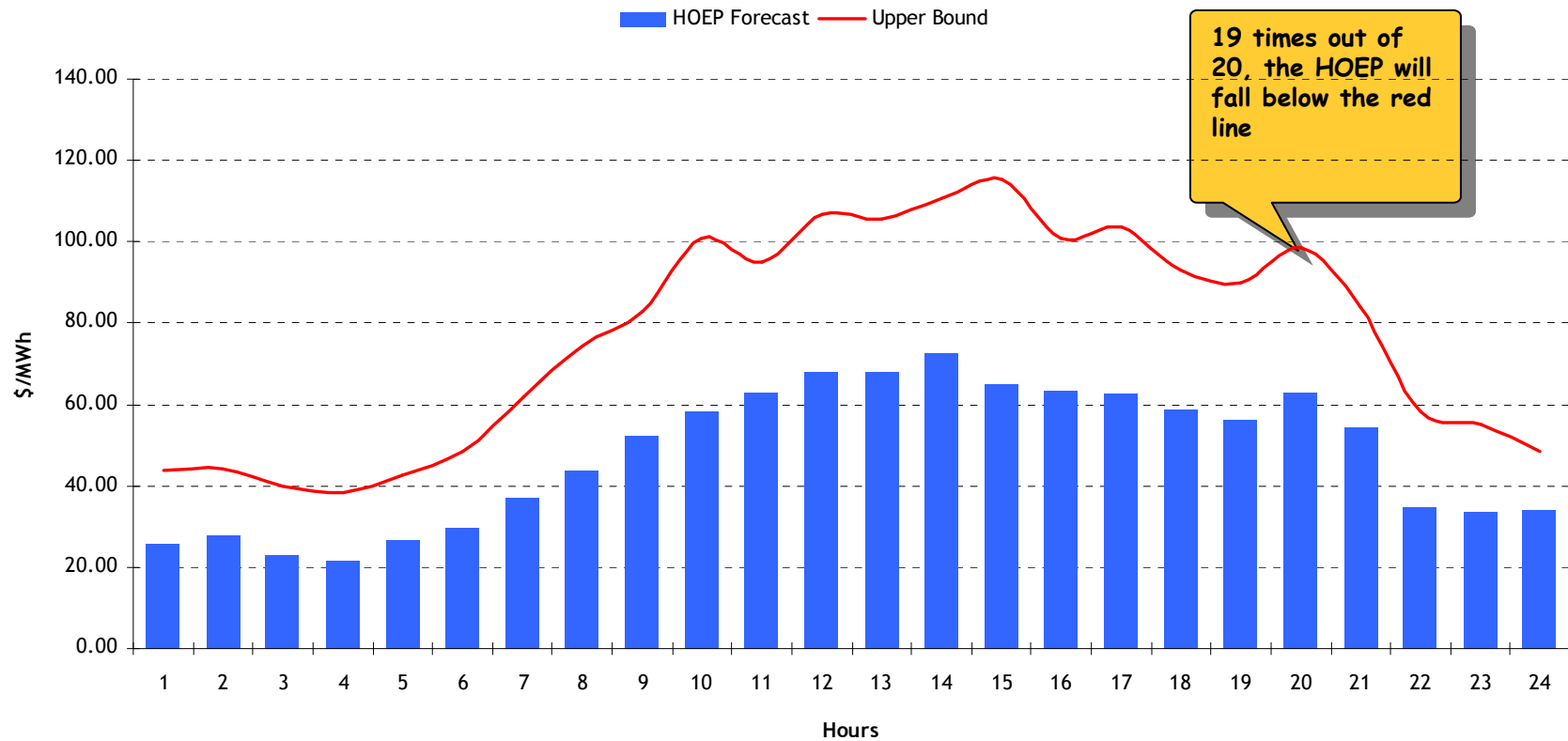


- Brief Overview of Model
- Performance Evaluation
- Conclusions

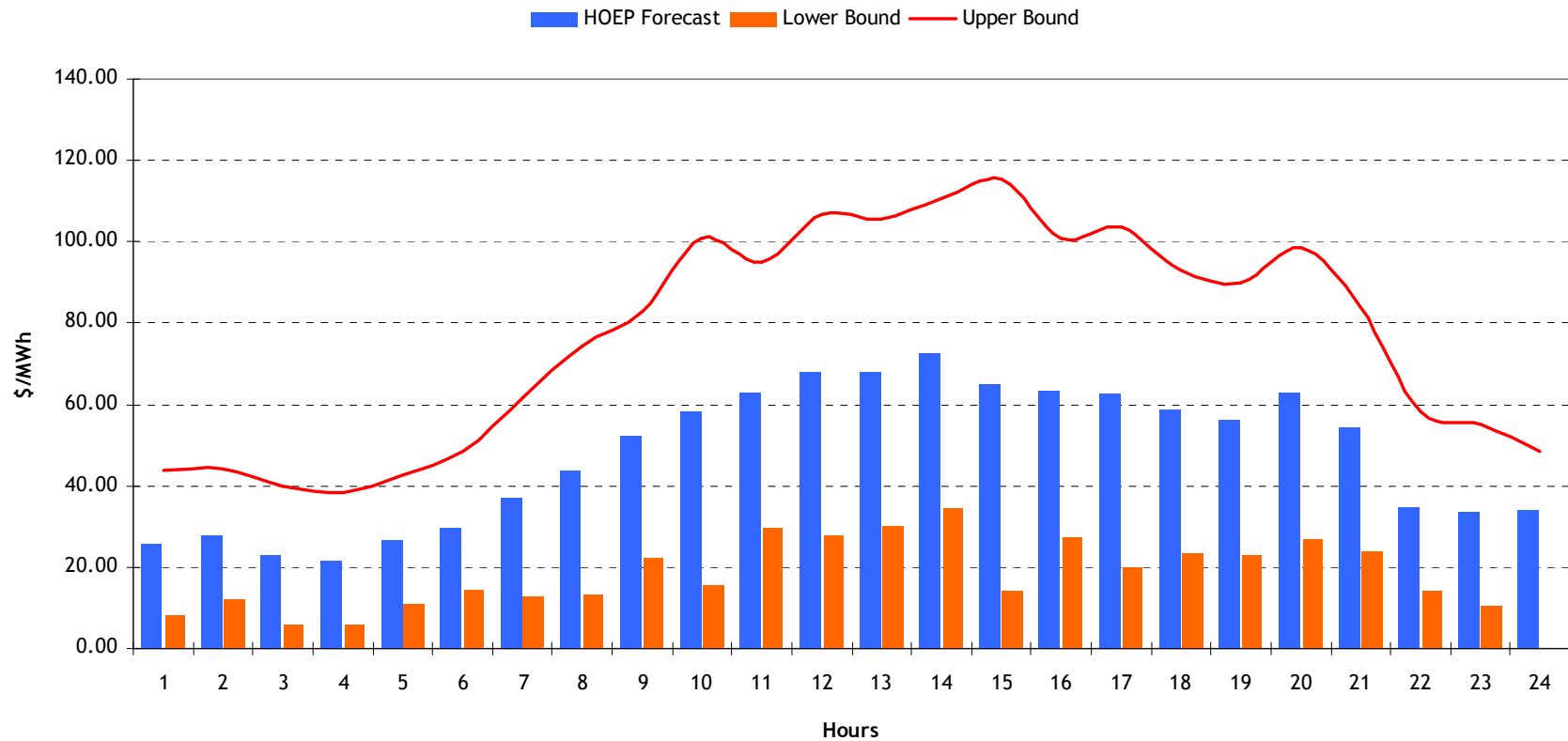
- Advance signals (prior day) of likely real-time prices can facilitate efficient decision making by consumers and producers of electricity
 - If advance signals provide a reliable reflection of eventual real-time prices consumers and producers can better plan their next day's production and consumption processes.
 - Allows ex ante decisions that are more likely to be efficient ex post.
- Many stakeholders have argued that current public advance price signals (pre-dispatch) are not reliable
- MSP have routinely requested that the IESO improve advance public price signals.
- Question:
 - Can the IESO produce a reliable forecast of real-time prices?

- Advance Price Notification for Ontario Hourly Pricing Project(publish forecasts at 5PM day ahead)
- Day ahead market Option 1
- Other applications- OPA/IESO DR programs, EDRP

HOEP Forecast for September 10, 2007



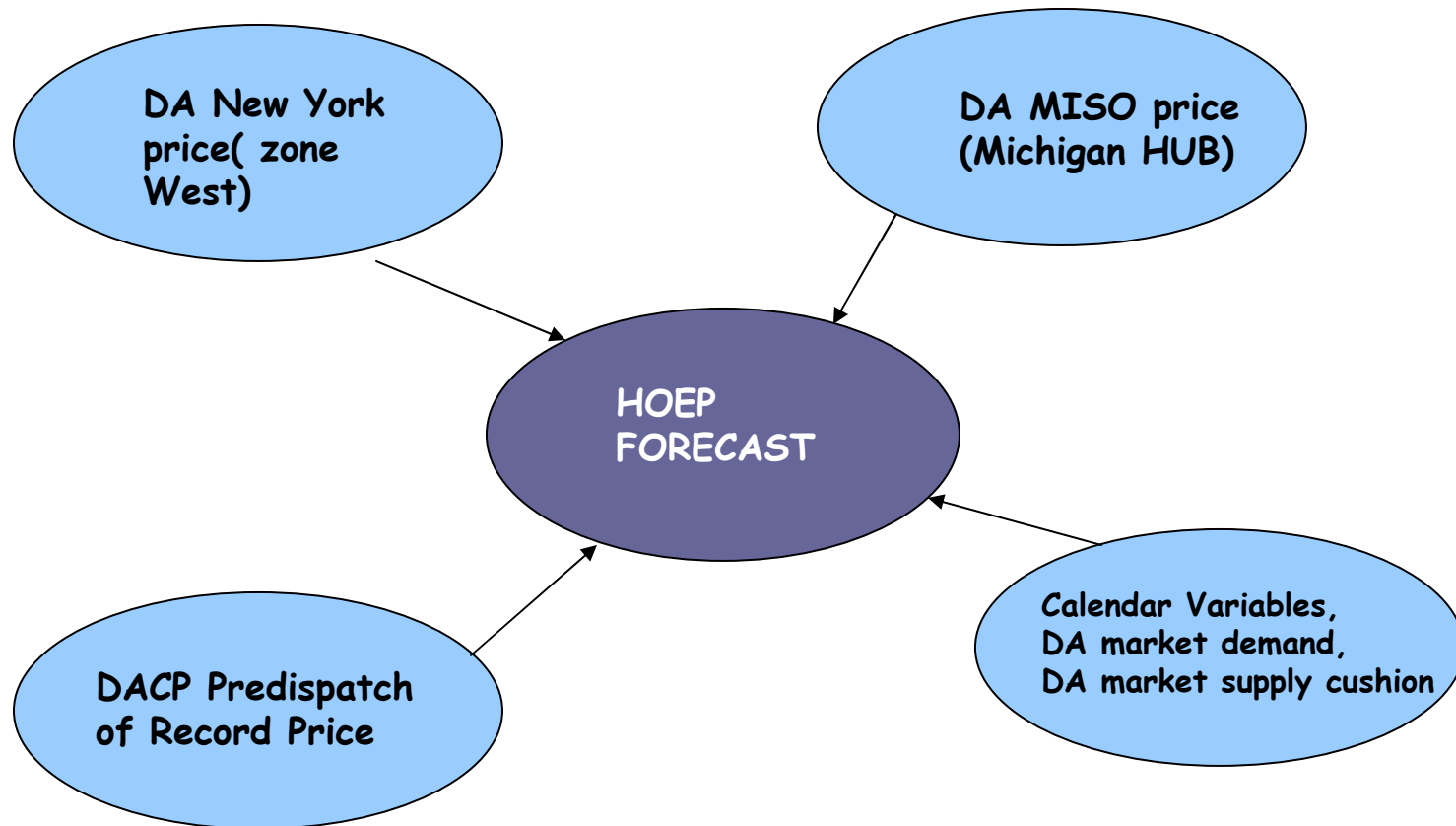
HOEP Forecast for September 10, 2007



Conceptual framework

- The price forecast model is driven by what information is available day ahead
- Basic Supply /Demand characterisation within a regional context

Price mainly a function of day ahead New York price, day ahead Michigan price, day ahead Ontario price, day ahead market supply cushion and calendar variables.



- How to estimate the price model
 - OLS(Least Squares) provides mean forecasts
 - QR (Quantile regression) provides median forecasts(Prof. Melino, University of Toronto)
 - LSTR (non –linear model)provides mean forecasts conditional on transition variables (Prof. Bunn, London Business School)
 - Trade off between complexity, availability of information, accuracy, transparency and usability

Forecast performance

- Performance evaluation using MAPE (Mean Absolute Percentage Error) computed on an hourly basis for the *out-of-sample* period May 2007 to August 2007.
- In the final analysis , OLS model was selected.

Table 2: Forecast Evaluation using DACP price in Model

Hourly Error Analysis

May 2007 to August 2007

Model	May 2007 to August 2007		
	PEAK	OFF PEAK	All hours
	28%	29%	29%
New York	30%	66%	43%
Michigan	44%	22%	36%

Average errors(Day ahead minus Real Time) May 2007 to August 2007

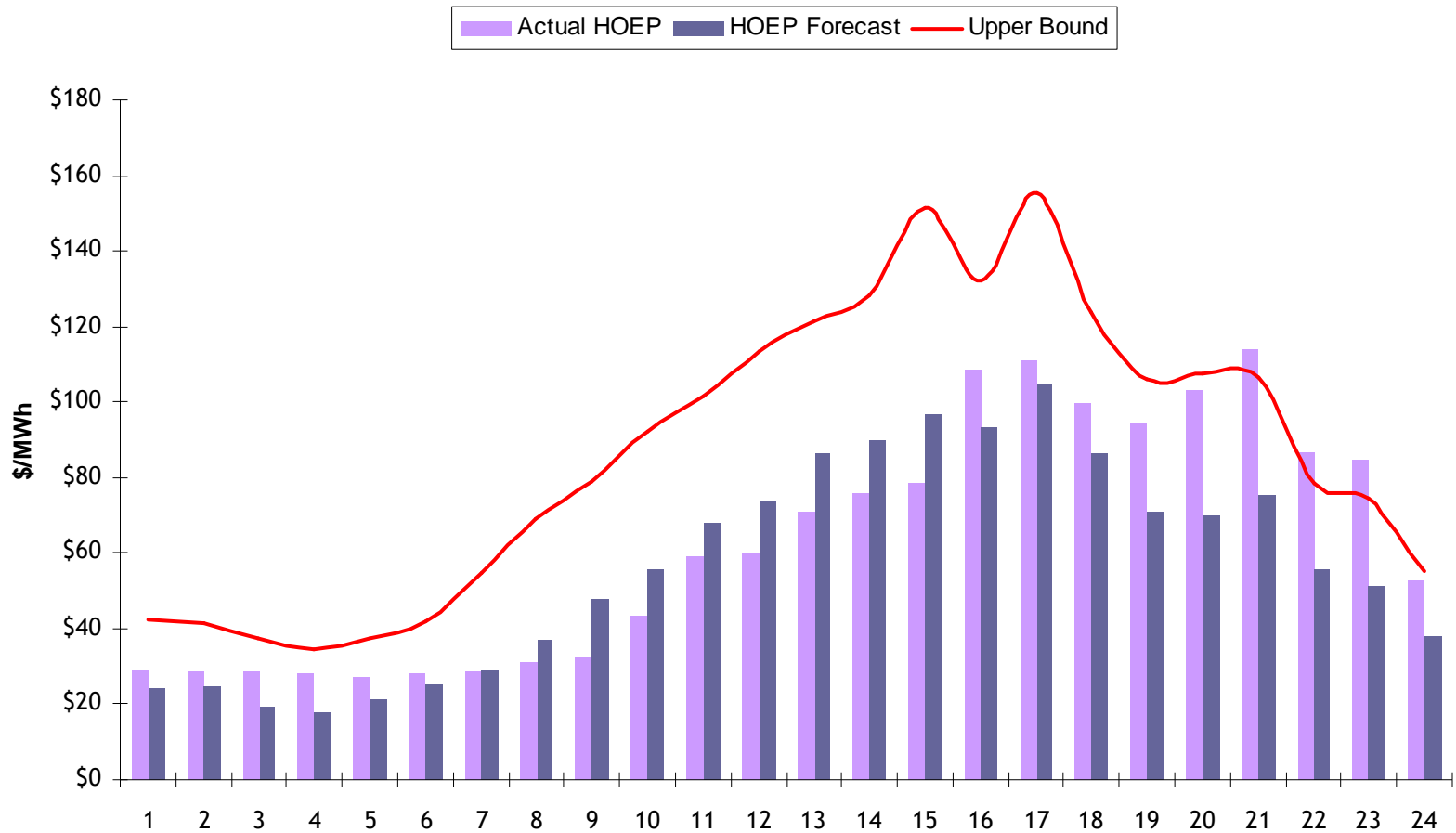
**Table 2a: Average Errors(Day Ahead minus Real Time)
May 2007 to August 2007**

Model	May 2007 to August 2007		
	PEAK	OFF PEAK	All hours
Model	-\$0.21	\$0.49	\$0.04
New York	-\$0.31	\$0.31	-\$0.09
Michigan	\$4.61	\$0.31	\$3.08

Evaluate model performance
using top 3 peak demand days in each of
June , July and August 2007.

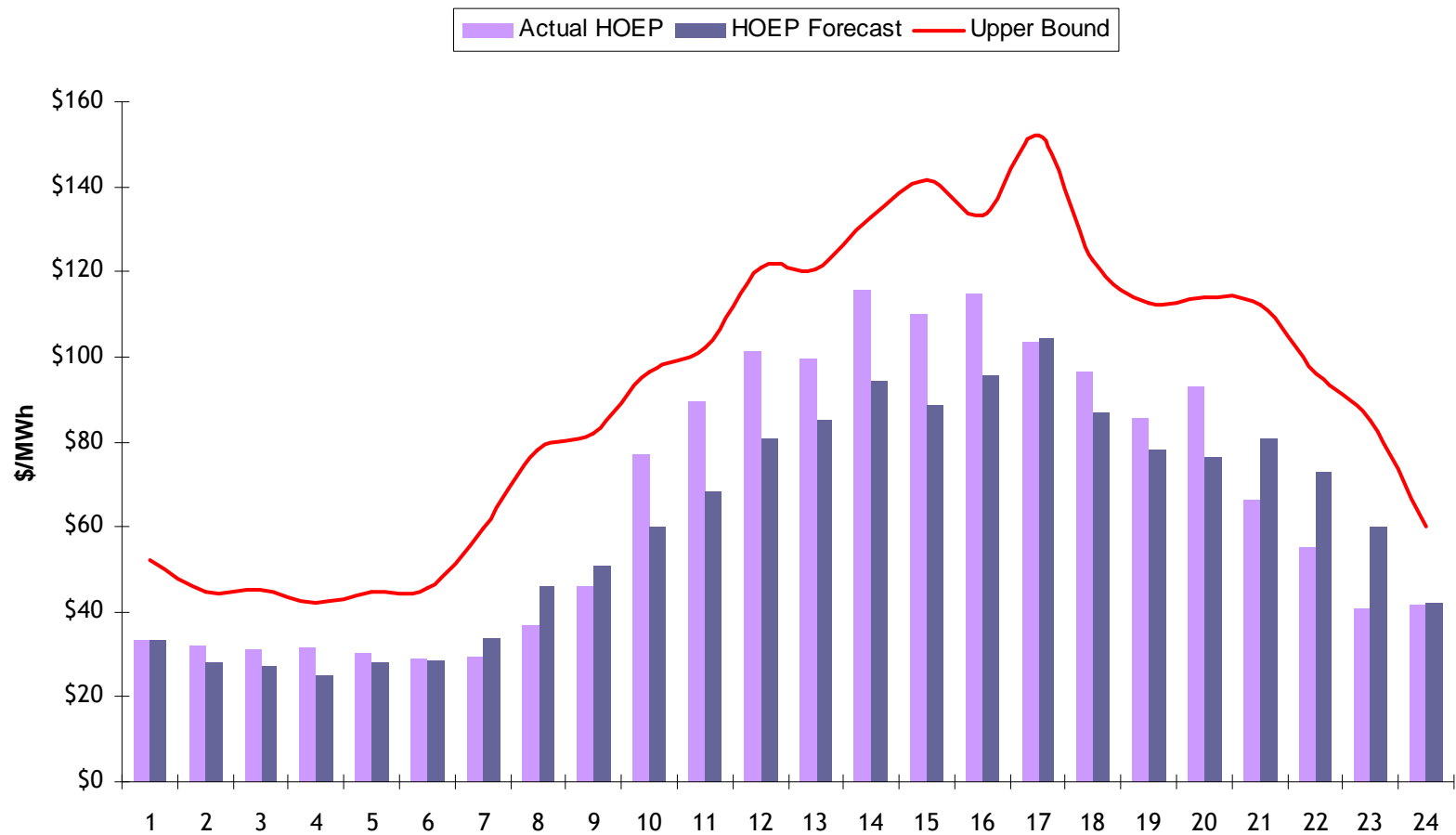
Model Forecast for June 25, 2007

HOEP Forecast June 25, 2007



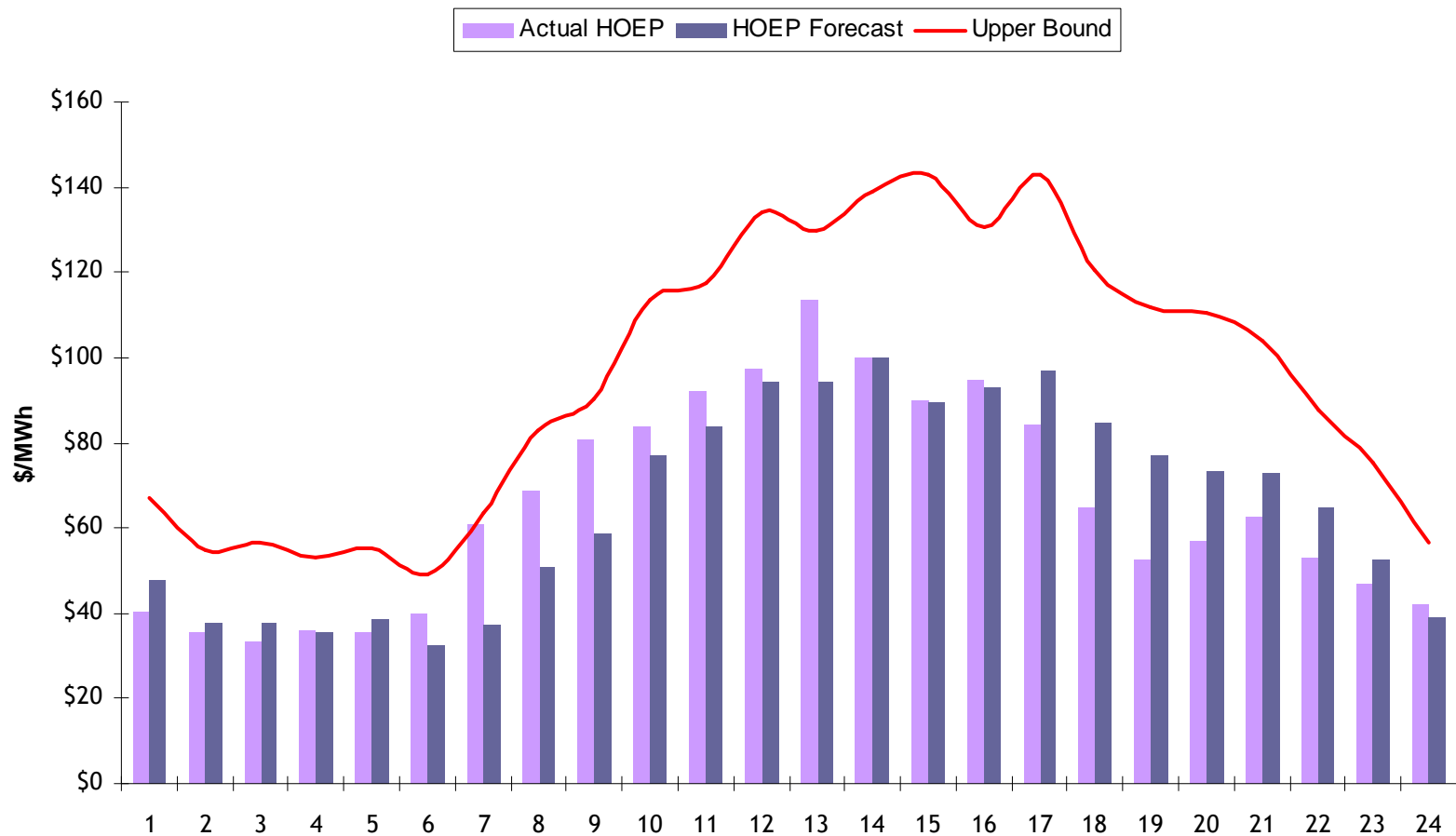
Model Forecast for June 26, 2007

HOEP Forecast June 26, 2007

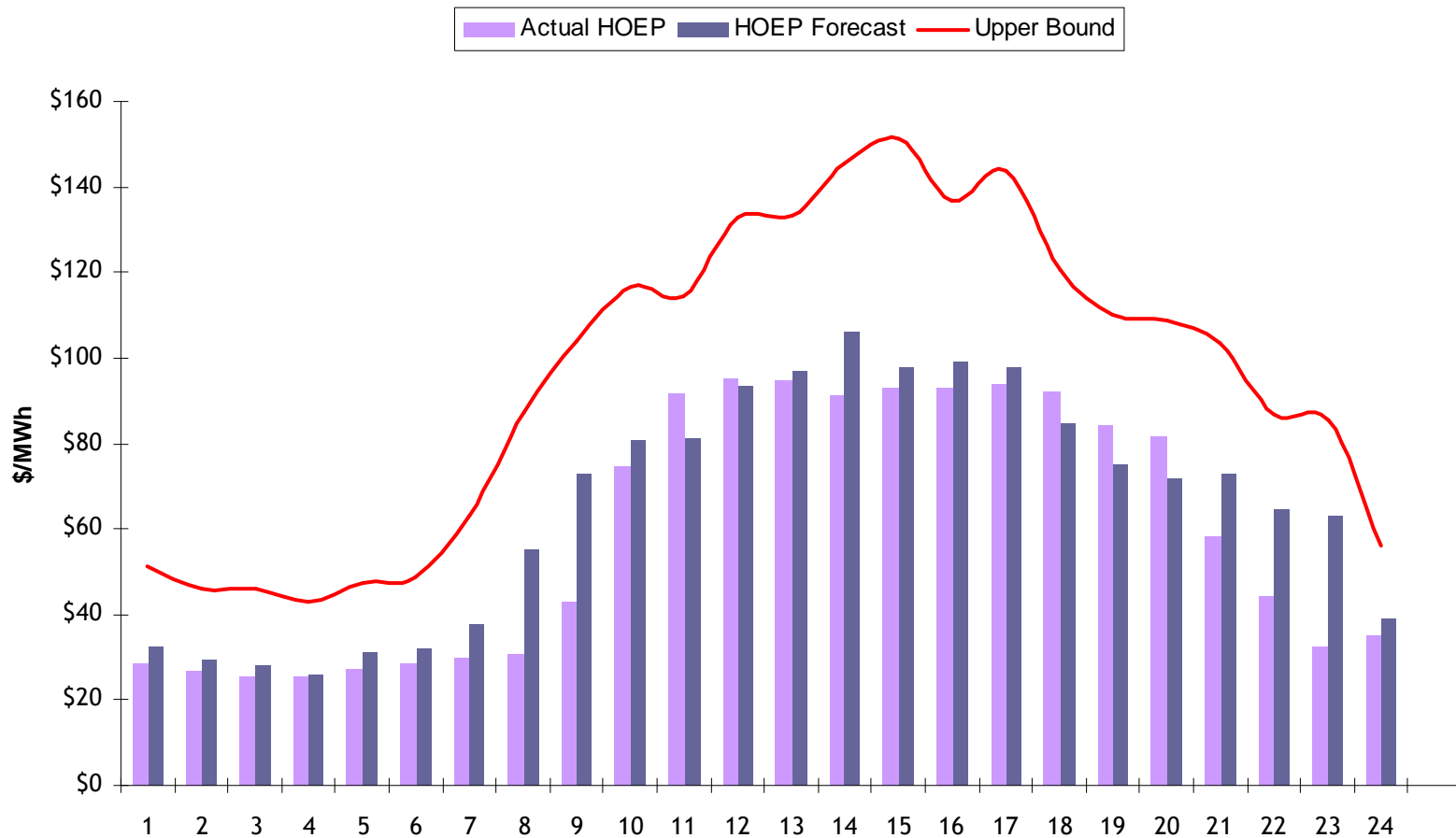


Model Forecast for June 27, 2007

HOEP Forecast June 27, 2007

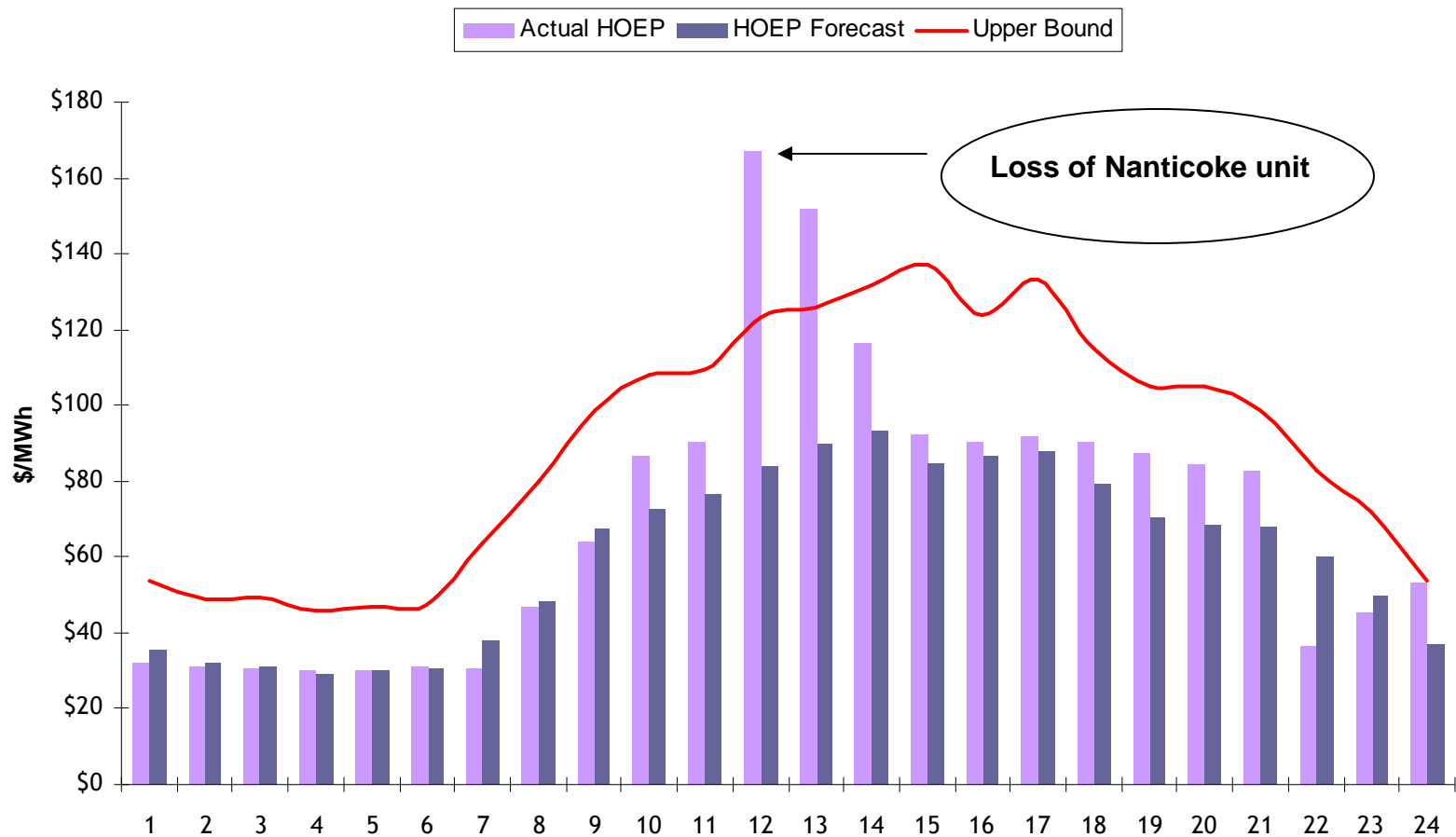


HOEP Forecast July 9, 2007



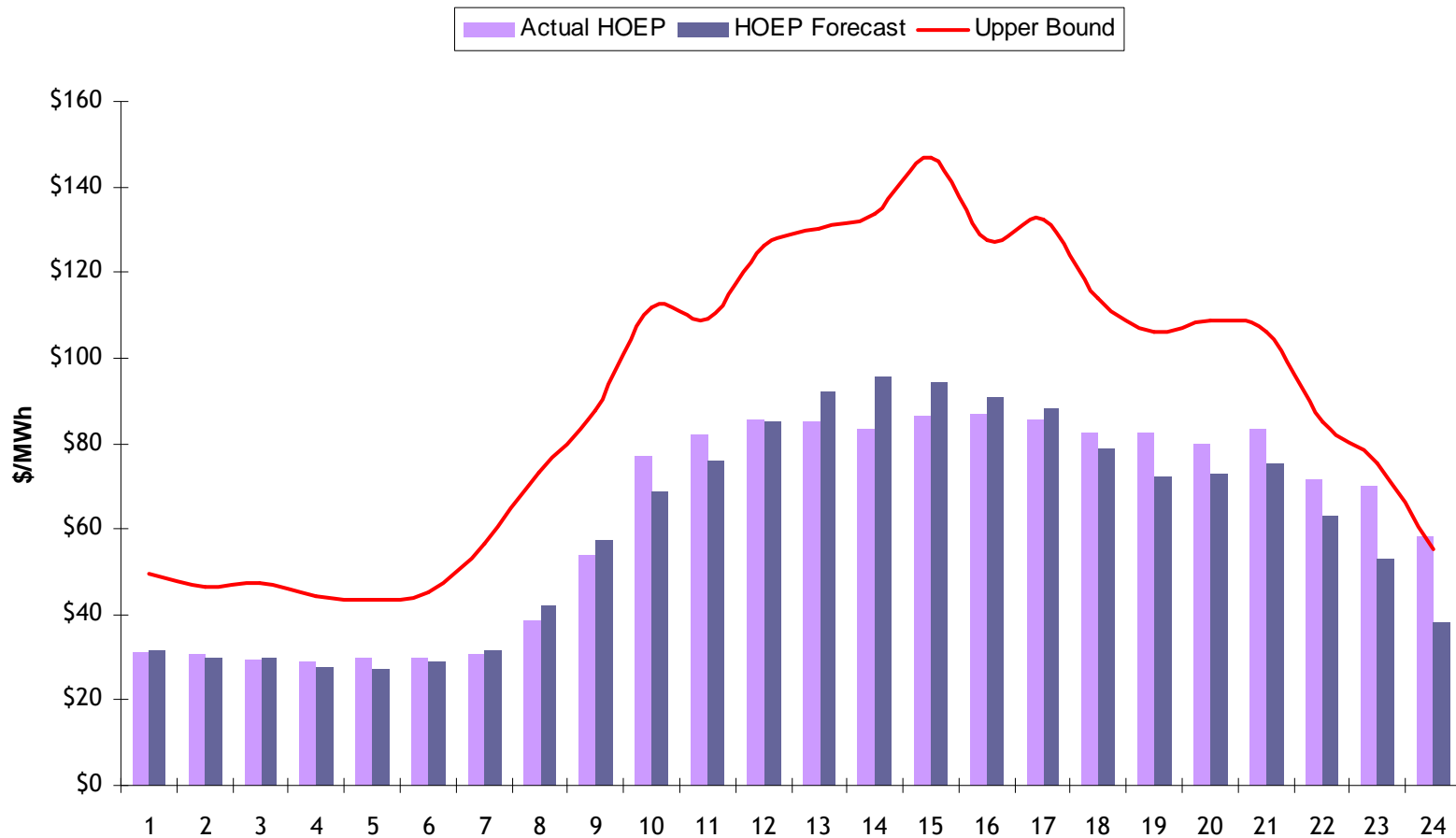
Model Forecast for July 10, 2007

HOEP Forecast July 10, 2007



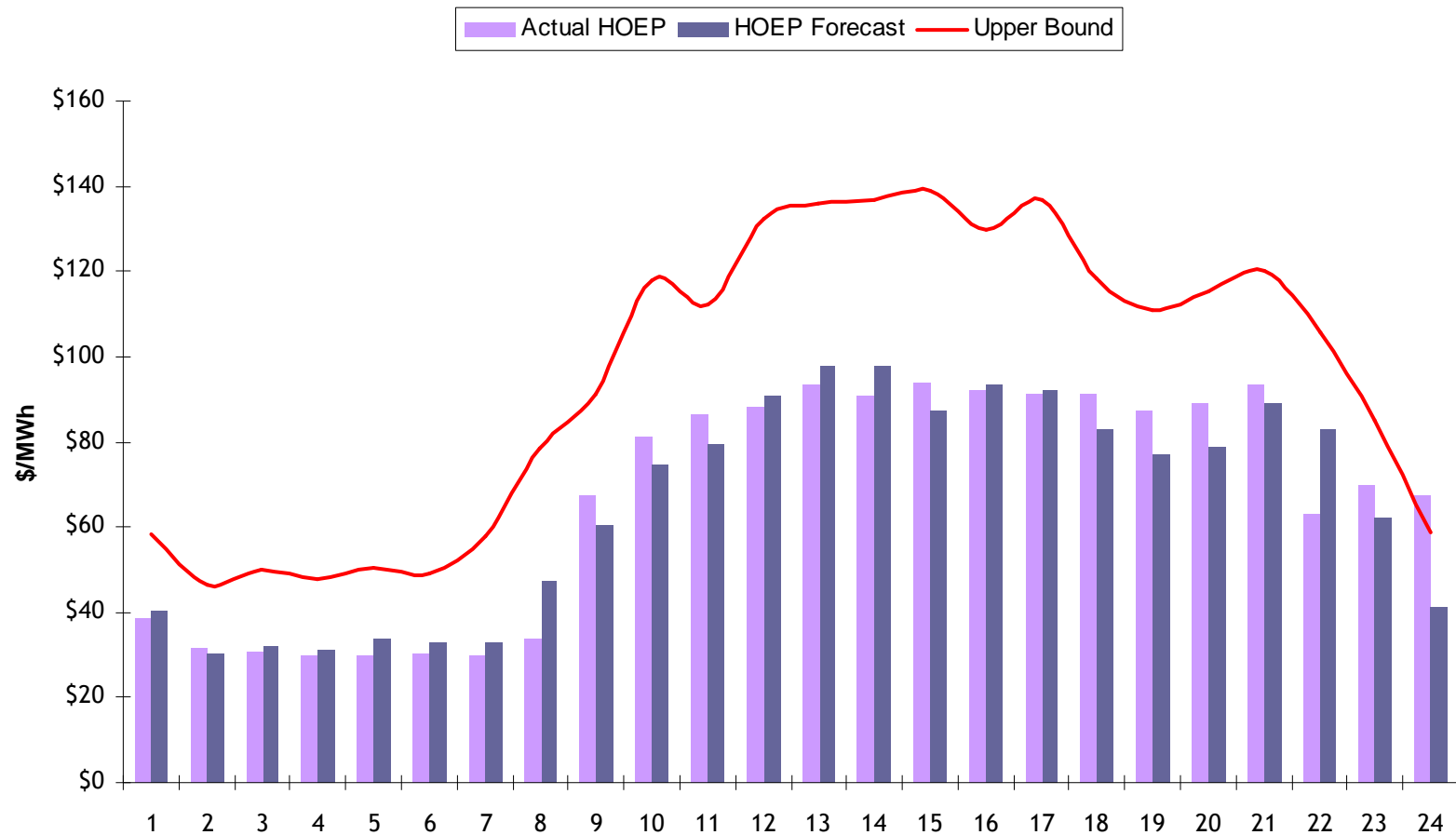
Model Forecast for July 31, 2007

HOEP Forecast July 31, 2007



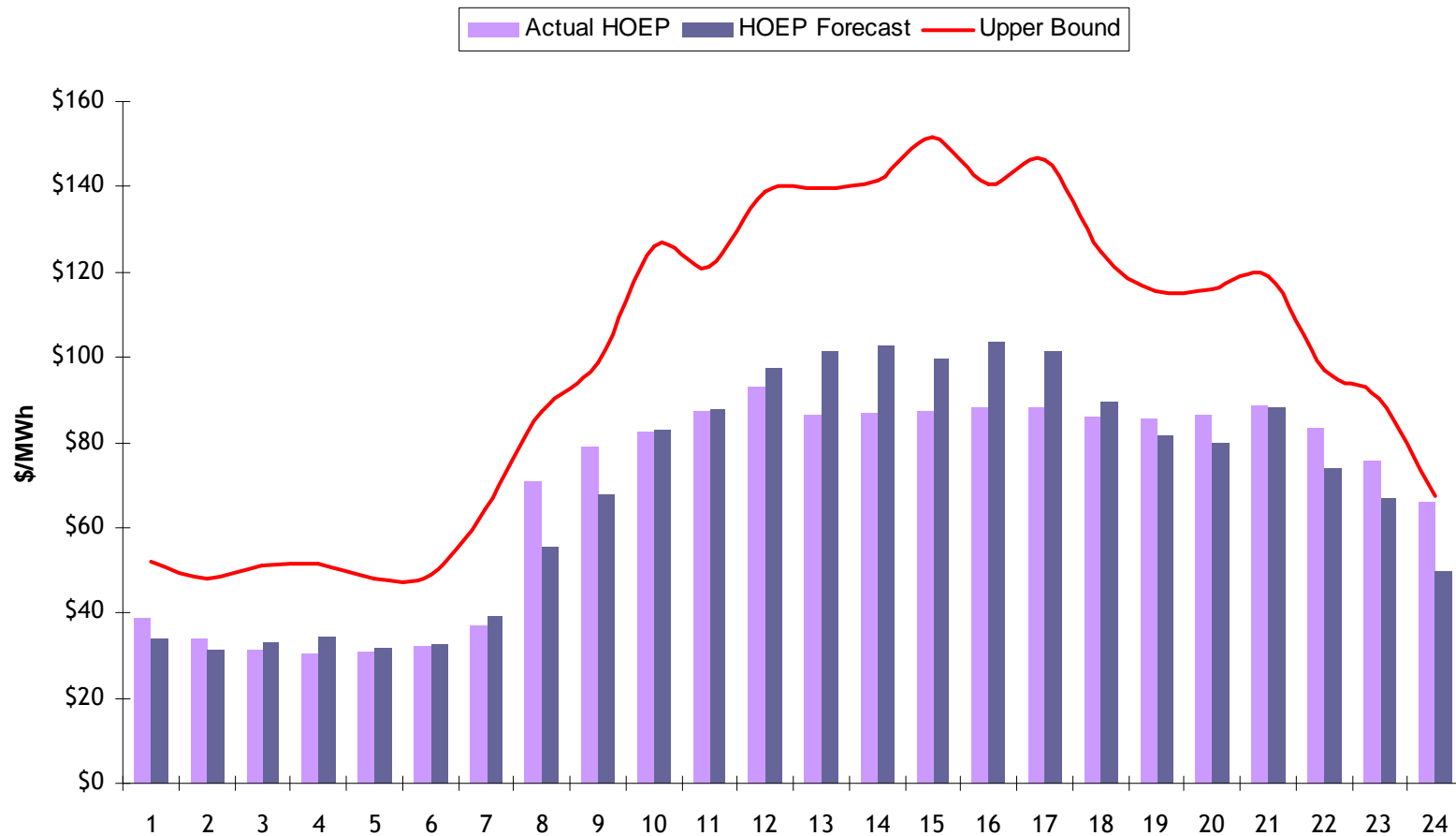
Model Forecast for August 1, 2007

HOEP Forecast August 1, 2007



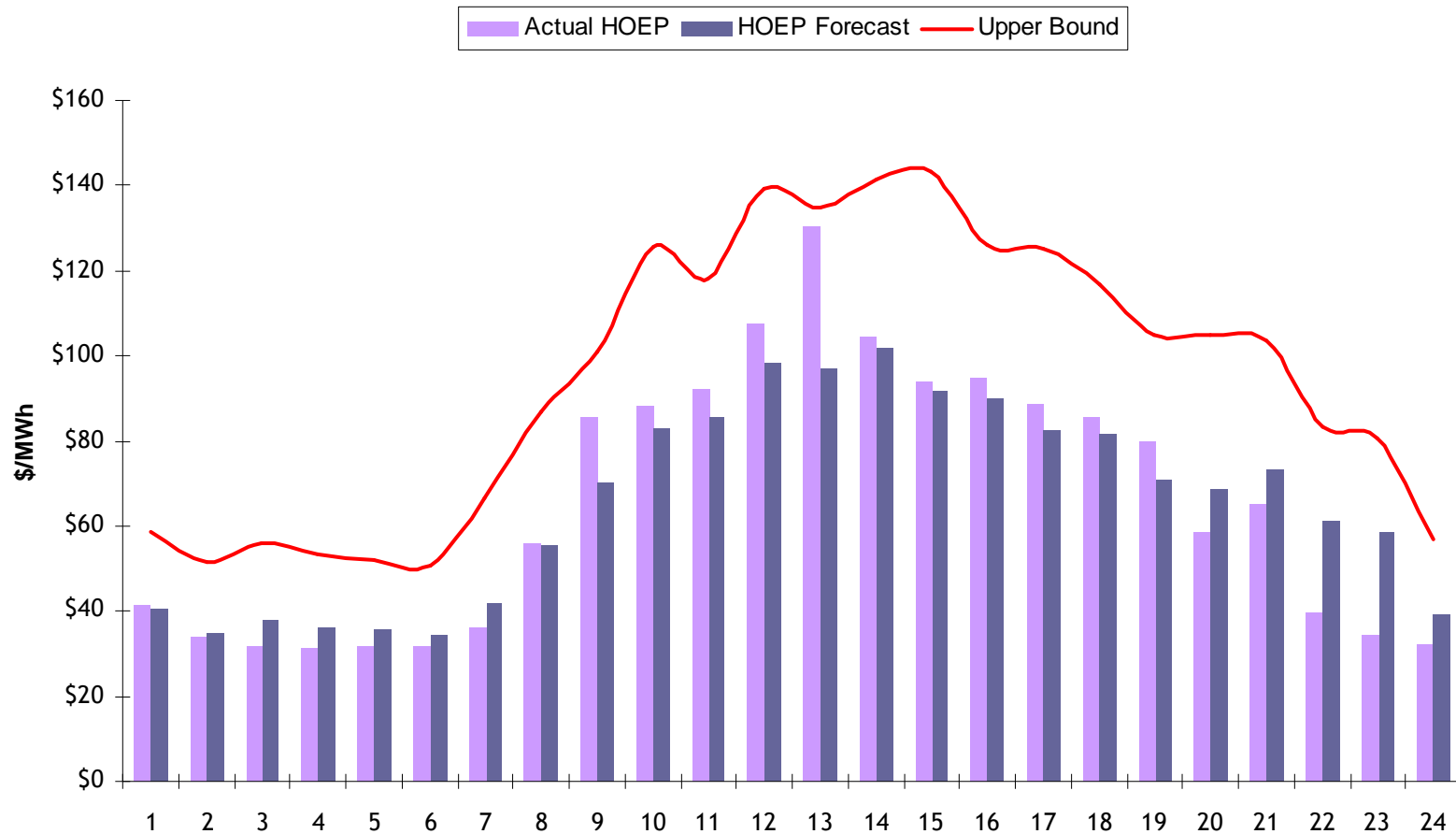
Model Forecast for August 2, 2007

HOEP Forecast August 2, 2007



Model Forecast for August 3, 2007

HOEP Forecast August 3, 2007



Comparative Performance using MAPE

Forecast Performance

	MAPE		
	25-Jun	26-Jun	27-Jun
Model	23%	16%	16%
New York	19%	23%	39%
Michigan	14%	29%	59%

	09-Jul	10-Jul	31-Jul
Model	21%	16%	8%
New York	23%	15%	17%
Michigan	20%	24%	20%

	01-Aug	02-Aug	03-Aug
Model	11%	10%	15%
New York	20%	25%	31%
Michigan	27%	21%	28%

Daily Average Errors(DA-RT) over peak demand days

	Daily Average Errors		
	25-Jun	26-Jun	27-Jun
Model	-\$6.0	-\$4.8	\$0.2
New York	-\$13.8	-\$23.8	\$0.2
Michigan	\$2.4	\$8.7	\$28.9
	09-Jul	10-Jul	31-Jul
Model	\$6.1	-\$10.0	-\$2.2
New York	\$6.6	-\$16.0	-\$5.2
Michigan	-\$11.0	\$9.8	\$5.7
	01-Aug	02-Aug	03-Aug
Model	-\$1.3	\$0.4	-\$0.2
New York	-\$16.4	-\$32.3	\$3.0
Michigan	\$1.0	\$5.7	\$6.4

	Total Number of hours over 9 peak demand days where absolute spread exceeded \$15	Average Error (RT-DA)
Model	49	\$1.98
MISO	93	-\$6.39
New York	93	\$10.84

- Model Forecasts compare well with price forecasts from day ahead markets
- Use forecasts for day ahead price notification

Additional Results

Risk and Spreads , May to August 2007

	Volatility	Day Ahead to RealTime spread
Ontario	28%	\$0.04
Michigan	40%	\$3.08
New York	43%	-\$0.09

- Volatility is measured as the standard deviation of the logarithm of the ratio of the price (i.e. $\log(P(t)/P(t-1))$)
- For Ontario the spread is between the Model forecast and the HOEP