Advance Notice of Wholesale Electricity Prices: Recommended Solutions

Quick Start Task Force Meeting
January 28, 2010

FRONTIER ASSOCIATES

and

Economead Energy Consulting

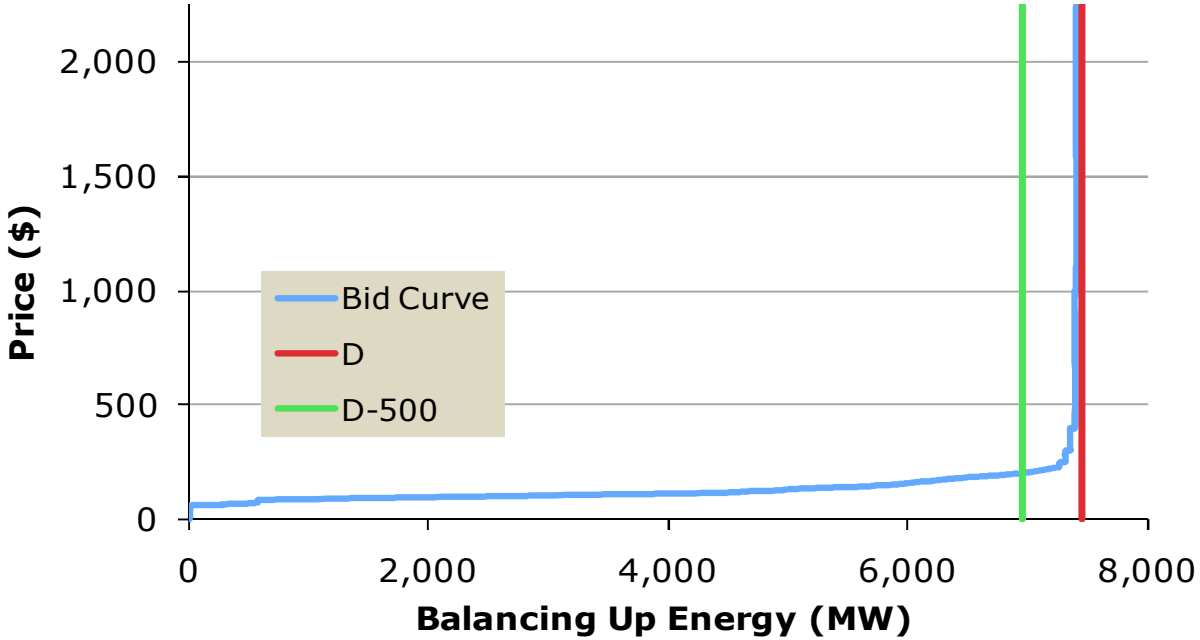
Outline

- Market Benefits of Providing Advance Notice of Prices
- Savings from Demand Response
- Price Notification in ERCOT Nodal
- Price Notification in other Wholesale Markets
  - Major Findings
- Recommended Solutions for ERCOT
- Questions & Answers

Market Benefit of Providing Advance Notice of Real-Time Wholesale Prices

- The amount of load reduction from voluntary load response actions during a spike in balancing energy prices or during a summer peak is thought to be roughly 600 MW. In this conservative example, 500 MW is used.

Figure 1: Potential Effect of Price Response on the MCP of Balancing Energy



Savings from Demand Response

- Given the typical shape of ERCOT's bid stack or supply curve for balancing energy, a 500 MW reduction in demand reduces price by 85 percent during a high price period.

Table 1: Savings (by Zone) from 500 MW of Demand Response

	Houston	North	South	West	Total
2008	$ 52,764,083	$ 27,657,466	$ 33,187,845	$ 7,451,438	$ 121,060,831
2009	$ 11,989,295	$ 2,689,794	$ 17,733,511	$ 638,512	$ 33,051,112
Total	$ 64,753,378	$ 30,347,260	$ 50,921,355	$ 8,089,950	$ 154,111,943
Average	$ 32,376,689	$ 15,173,630	$ 25,460,678	$ 4,044,975	$ 77,055,972

- Assuming that 167 MW of load in each zone opts to not purchase balancing energy in response to these high price events and that demand response affects prices by the second 15-minute interval, the savings to consumers from 500 MW of price response demand reduction is about $77 million per year.

Savings from Demand Response (Continued)

Å If the price was adjusted so that demand response was reflected in the market price in the first 15-minute interval in which the response occurred…

…the annual savings from 500 MW of demand response would increase to $139 million.

Å The savings could be achieved by treating price-responsive loads as a dispatchable resource, or through other means.

Price Notification in ERCOT Nodal

- Real time locational marginal prices (LMPs) are set approximately every five minutes and provided instantly to resources via telemetry, although generators will be settled on a 15-minute interval (10-minute in CAISO, 60-minute in PJM, etc.).
- No advance notice of price for load occurs in the nodal market.
  - There will be a lag of 10 to 30 seconds following issuance of a Security-Constrained Economic Dispatch (SCED) instruction before the load-weighted average load zone price (LMPz) for that 5-minute SCED interval is known by consumers.
  - loads continue to be settled on 15-minute interval data, not the load zone-equivalent 5-minute SCED price.

Price Notification in ERCOT Nodal (Continued)

- Consumers will therefore not know the actual settlement price until well into the last few minutes of each market's settlement interval.
- This results in prices which do not match the costs incurred at the time.

Figure 2: Settlement Cost of Power to the Consumer Should Be $20, Rather than $673

Load Level	**1 MWh**	**0 MWh**	**0 MWh**
Price	**$20/MWh**	**$1,000/MWh**	**$1,000/MWh**

t0 **t_0 + 5 minutes** **t_0 + 10 minutes** **t_0 + 15 minutes**

$673 = 1 MWh * [($20 + $1000 + $1000) /3]

Price Notification in Other Wholesale Markets

Å The following seven wholesale electricity markets were included in the survey:

- ï **ISO-NE**: New England Independent System Operator
- ï **NYISO**: New York Independent System Operator
- ï **PJM**: Pennsylvania-New Jersey-Maryland Interconnection
- ï **AEMO**: Australian Energy Market Operator
- ï **AESO**: Alberta Electric System Operator (Alberta, Canada)
- ï **IESO**: Independent Electricity System Operator (Ontario, Canada)
- ï **CAISO**: California Independent System Operator

Major Findings

Å The need for advance notice of price information is widely recognized

Å At least one of the following two mechanisms is used:

- ï Announcing prices several minutes in advance of each operating interval
- ï Providing price forecasts on a frequent basis well in advance of each operating hour

Å NYISO, considered to be one of the world's most "complete" and advanced wholesale electricity markets, provides prices to consumers five minutes in advance of each settlement interval.

Major Findings (Continued)

Å Similarly, CAISO provides pricing updates five minutes before the trade period by announcing prices in its Open Access Same-time Information System (OASIS) as well as on its webpage.

- ï These prices are not binding.
- ï Rather, ex-post prices are used for settlement purposes.

Å A number of other markets, including the competitive wholesale markets in Ontario, Alberta, Australia, and New England, provide price forecasts to the market to facilitate price responsive load activities.

Real Time Price Notification in Selected Markets

Market	Advance Notice of Price	Settlement Interval	Price Forecast	Communication (Publicly Available)
ISO-NE	**Ex-Post** after the end of each 5-minute interval	**Hourly**	Price forecast in Day Ahead for hours during the operating day. Hourly price forecast in Operating Day two-hour in advance	Website
NYISO	**Ex-Ante**, 5-Minute in advance	**Hourly**	No	Website
PJM	**Ex-Post** after the end of each 5-minute interval	**Hourly**	No	N/A
Australia	**Ex-Post** after the end of each 5-minute interval	**30-minute**	Price forecast reflecting various demand scenarios is published every 30 minutes for the next trading day	Website
AESO	**Ex-Post** pool price after the end of each operating hour	**Hourly**	Price forecast two hours in advance of each operating hour	Website
IESO	**Ex-Post**, 2 minutes after the end of each 5-minute operating interval	**Hourly**	Hourly price forecasts are provided beginning 36-hours ahead till one hour before operating hour	Website
CAISO	**Ex-Post** after the end of each 5-minute interval	**10-minute**	Non-binding price updates 5-minute before each operating interval	Website

Recommended Solutions for ERCOT

- Providing Advance Notice of Settlement Prices
- **Using the SCED interval as the Settlement Interval**
- **Providing Informational Price Forecasts During the Operating Day**
- **Establishing a Special Economic Demand Response Program Based on Binding Forecasts of Prices**
- Allowing Price Responsive Loads to be Modeled Directly in SCED Model

Solutions: Using the SCED Interval as the Settlement Interval

Å This would need to be limited to only a small number of price-responsive participating loads, in order to minimize system impacts.

Å Better matches prices to costs.

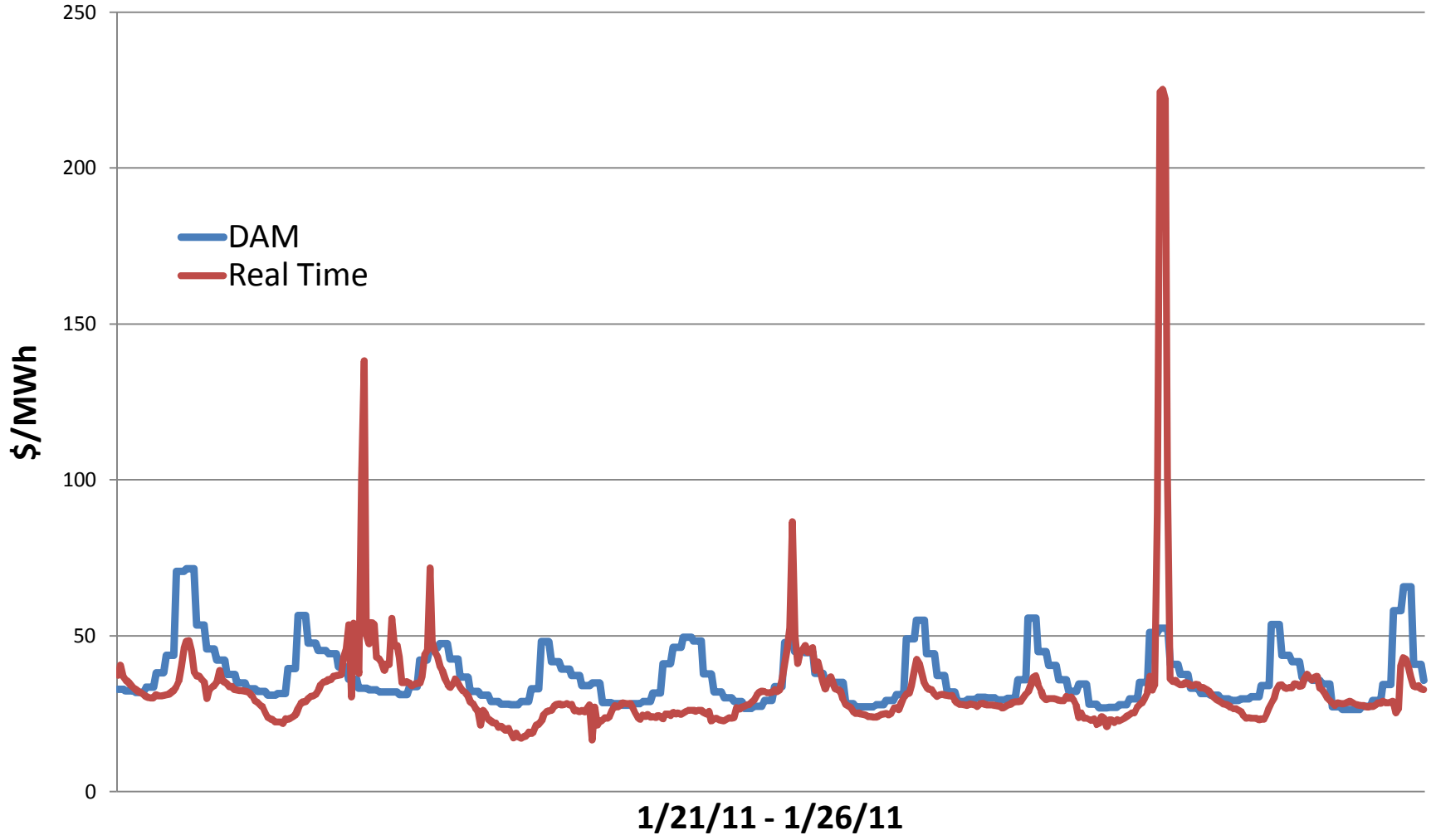
Å Maintains previous savings from demand response and may even encourage further responses

Å Will have impacts on settlement software. The scope of such impact has to be determined.

Solutions: Providing Price Forecasts During the Operating Day

- Provided by some other ISOs (CAISO, Ontario IESO, Alberta, and New York)
  - CAISO provides price forecasts at least 5 minutes in advance of real time
  - This is a practical and reasonably inexpensive way to encourage more participation by price responsive loads
- We recognize ERCOT's reluctance to get into this business.
- DAM prices are not a reasonable forecast of real-time prices
  - DAM prices are hourly while real-time prices change every 15 minutes
  - Unexpected events between the day-ahead and real-time will result in a divergence between day-ahead and real-time prices

DAM Prices vs Real Time Prices



Past Price Changes are not a Good Predictor of Future Price Changes

HB_North = Intercept + HB_North_delta + HB_North_delta_t-1 + HB_North_delta_t-2 + HB_North_delta_t-3

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.542582154
R Square	0.294395394
Adjusted R Square	0.290351814
Standard Error	17.17510148
Observations	703

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	85906.03007	21476.51	72.80564	1.45846E-51
Residual	698	205898.9095	294.9841		
Total	702	291804.9396			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	32.32844036	0.647773445	49.90702	1.9E-232	31.05662244	33.60025828	31.05662244	33.60025828
HB_NORTH_delta	0.709145195	0.046179806	15.35618	4.59E-46	0.618477223	0.799813167	0.618477223	0.799813167
HB_NORTH_delta_t-1	0.215845799	0.046451683	4.646673	4.03E-06	0.124644031	0.307047566	0.124644031	0.307047566
HB_NORTH_delta_t-2	0.357939702	0.046451588	7.705651	4.48E-14	0.266738122	0.449141282	0.266738122	0.449141282
HB_NORTH_delta_t-3	0.172135332	0.046179302	3.727543	0.000209	0.081468349	0.262802314	0.081468349	0.262802314

Solutions: Establishing a Special Economic Demand Response Program Based on Binding Forecasts of Prices

- Done in Ontario.
- Would be similar to utility-run critical peak pricing or real-time pricing programs where participant is:
  - Compensated based on the demand reduction during the peak price period relative to a baseline load level, or
  - Pays for its consumption during the peak price period at the forecast price
- Decisions have to be made regarding baseline load level, the timing of forecast to be released, and ways to communicate price forecast with participants

Contact Information

Jay Zarnikau at Frontier Associates:

jayz@frontierassoc.com

Parviz Adib at Economead:

parviz.adib@economead.com

Questions