“Market Liquidity: Means, Ends and Myths”

Harvard Electricity Policy Group
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What is Nodal Exchange?

• Cash-settled electric power futures exchange
• Launched April 2009: over 70 signed participants
• Providing ability to trade ~1,800 hubs, zones, and nodes across six RTOs/ISOs: ISO-NE, NYISO, PJM, MISO, CAISO and ERCOT
• Monthly terms extending out up to 68 months
• Two platforms:
  – Auction and
  – Over-the-counter (OTC) negotiated transactions (e.g., broker) submission for clearing
• Auctions held daily
• Central counterparty cleared market for all transactions through LCH.Clearnet
• Value-at-Risk (VaR) based margining methodology
Nodal Exchange open interest has been growing significantly since its launch in April 2009 – and already has 12% market share of cleared power futures/swaps.
Nodal market design permits more efficient decision making and provides trading flexibility to hedge using hubs, zones or nodes

• Locational Marginal Prices at each node permit accurate economic information about where to best locate new generation and transmission in the organized markets in North America

• One price across a market (e.g., the United Kingdom) does not aid in determining where to place the next transmission line or generation facility to most efficiently meet demand

• Participants in the North American nodal markets are able to hedge using a variety of means:
  ➢ Financial Transmission Right (FTR) markets
  ➢ Bilateral trades (non-cleared)
  ➢ PPAs
  ➢ Cleared trades (e.g., Nodal Exchange, NYMEX, ICE)
“Forward” trading is healthy in the organized North American markets, although total cleared trades have been slightly down, FTRs are up.

![Graph showing "Forward" power trading in North America](image)

- Cleared trades are currently mostly hubs, but zones and nodes are growing.
- FTRs and bilateral trades are mostly basis trades.

Note: Bilateral non-cleared trading volume is estimated, but will soon be known given the reporting requirements of the Dodd-Frank Act.
FTR markets are robust, with overall volumes growing an average of 28% per year over the past five years – with auctions just once a month.

FTR Auction Volume in Calendar Year Over Time

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<tr>
<th>Billions of MWh</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
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<th>2010</th>
<th>2011</th>
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60% of Nodal Exchange volume is from hubs and 40% from zones and nodes – most trades are spreads from hubs, zones or nodes to a hub.
There is about 80 million MWh of non-hub cleared open interest in PJM

PJM Zonal Open Interest
As of Feb 17 2012

- Nodal Exchange: 45%
- ICE: 24%
- NYMEX: 31%
A hedging example:
Point Beach Nuclear Power Plant in Two Creeks, Wisconsin

- An asset owner has sold forward 100MW of power at the generation node for 2010 at $35/MWh and now in early 2009 needs to hedge a refueling event (plant down) for 2010
- The entity now wants to lock in a $5/MWh profit ($4.4 MM) for 2010
- They assume that the basis difference in 2010 will be the same as the actual value in 2008 (information about 2009 is incomplete)
- Profit = $35 – Hedge Price_{Location} + LMP_{Location} – LMP_{Node}
- They can hedge at: 1) the Point Beach node, 2) the WEC.N Zone, 3) Cin Hub or 4) PJM Western Hub
What is the variability from hub to node or zone to node?

Historical Hub and Zone to Node Variability
- Point Beach Nuclear Power Plant Example-

Basis varies over time, even when looking at annual averages which smooth daily and monthly values.
How do the various possible Point Beach hedges do at locking the $5/MWh ($4.4MM in total) profit?

<table>
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<tr>
<th>Hedge Type</th>
<th>Historic Basis Using 2008 LMP ($/MWh)</th>
<th>Hedge Price ($/MWh)</th>
<th>2010 Point Beach Settlement ($/MWh)</th>
<th>Total Profit¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Point Beach Node</td>
<td>$0</td>
<td>$30.00</td>
<td>$29.63 ($0.00 Basis)</td>
<td>$4.4MM</td>
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<tr>
<td>WEC.N Zone</td>
<td>$10.56</td>
<td>$40.56</td>
<td>$29.63 ($3.89 Basis)</td>
<td>-$1.5MM</td>
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<td>Cinergy Hub</td>
<td>$3.74</td>
<td>$33.74</td>
<td>$29.63 ($5.81 Basis)</td>
<td>$5.6MM</td>
</tr>
<tr>
<td>PJM Western Hub</td>
<td>$22.83</td>
<td>$52.83</td>
<td>$29.63 ($16.95 Basis)</td>
<td>-$0.8MM</td>
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</table>

Profit is still variable with the inaccurate hedges

¹Profit is calculated as 100MW*8760*($35.00/MWh – Hedge Price/MWh) – (Node Settlement/MWh – Hedge Location Settlement/MWh)]. Where 8760 is the number of hours in the year
Nodal hedging issues

• Currently, entities do not always hedge at the node because:
  – Hedger may decide that the hedge price is more attractive at the hub or zone relative to hedge price available at the node
  – Hedger may be concerned about ability to economically add or subtract from the hedge position if they are exposed to variable demand

• However, not trading at the node adds significant risk based on the variability of basis risk between the actual node and the hub/zone location used for hedging

• Markets such as Nodal Exchange are bringing transparency and greater liquidity to more granular locations to enable better hedging

• Voice brokers, participant negotiations and indicating auction interest play key roles in providing nodal liquidity on Nodal Exchange
More bilateral trades, which are often basis trades, will move to cleared markets under the Dodd-Frank Act – and clearing also benefits participants.

**Clearing benefits for participants include:**

1. Access to a wider range of market participants resulting in greater liquidity and better pricing; less than half of the top 50 FTR traders are rated investment grade

2. Very limited default risk and no need to monitor counterparty risk

3. Total transaction cost, including default risk, is often lower than bilateral transactions that are not cleared
   - CCRO paper “Market Clearing in the Energy Industry” Feb 2006 estimated default risk for non-cleared trades at 84 basis points

4. Clearing allows netting of positions across the portfolio, lowering margin

5. Aids in meeting new regulatory requirements under the Dodd-Frank Act
   - Reporting, margining, and clearing if contract is designated for mandatory clearing and one party is not an end user hedging on the transaction
Cleared markets provide access to more counterparties, lowering price risk versus bilateral markets

**Top 50 FTR Participants**  
(Representing 95% of Volume)

- 44% Rated Investment Grade
- 5% Rated Baa3
- 44% Not Rated
- 7% Rated Below Baa3; Not Investment Grade

Source: Nodal Exchange Analysis, ratings from Moody’s Long Term Unsecured ratings as available and FTR Data is volume weighted from Monthly, Annual and Long-term Auctions in PJM, ISONE, NYISO, MISO, CAISO held June 2009 to May 2010
Definition of 'Liquidity'

1. The degree to which an asset or security can be bought or sold in the market without affecting the asset's price. Liquidity is characterized by a high level of trading activity. Assets that can be easily bought or sold are known as liquid assets.

2. The ability to convert an asset to cash quickly. Also known as "marketability".

Source: Investopedia
... but so is hedging location to price risk

Definition of 'Hedge'

Making an investment to reduce the risk of adverse price movements in an asset. Normally, a hedge consists of taking an offsetting position in a related security such as a futures contract.

Source: Investopedia
Nodes have lower hedging risk but higher liquidity risk, and hubs have the opposite profile: perhaps trading nodes has lower total price risk for hedgers.

**Total Price Risk** = **Liquidity Price Risk** + **Hedge Location Price Risk**

*Note: if the required hedge is the load zone itself, then the hedge location risk for the zone is of course to the far left. Also, trading the zone as a hedge to the node to exit a position for example, leaves only the residual hedge location risk between the node and zone while reducing the liquidity price risk of the node versus the zone and thereby likely reducing total price risk versus alternatives such as trading the hub.*