Electricity Markets Outlook

November 30, 2006
Key Questions

• Is the current market adequate?
  — Adequate infrastructure investment
  — Adequate demand response
  — Promoting increased efficiency and alternative energy objectives

• If not, how can we get there?

• When is it needed?
Today, the markets are at a fork in the road

- Non-discriminatory, economic dispatch
- Transmission access
- Fair Competition
- Demand response
- Access to full energy price
- New generation
- Alternative/renewables
- Entrepreneurial development

ISO/RT0
- Reliability
- Planning
- Dispatch

ICE/NYMEX Exchanges
- Hubs
- Spread
- Options

ISO Markets
- Energy RT/DA
- FTR
- Capacity

Top Down Mandates:
Command and Control Regulation
- Percent DR
- Capacity payment
- Percent Revenues
- Cross subsidies
- Typically short-term fixes

Enables Market

Fair Competition
- Non-discriminatory, economic dispatch
- Transmission access

Efficiency
- Demand response
- Access to full energy price

Investment
- New generation
- Alternative/renewables
- Entrepreneurial development

1) Price cap gaps (and socialized dispatch)
2) Time horizon gaps
3) Product gaps
- Can we envision a more robust market?
- Is is feasible?
If you build it they will come . . . Or will they?

Trading Volume Comparison
– First Half of 2006 –

Bilateral = Exchange

ISO-NE (6.8x)
PJM (6.2x)
MISO (3.8x)
NYISO (2.5x)

5-10x Growth

Corn¹ (25x)
Natural Gas² (40x)

Exchange Volume Trading Ratio
(Financial Traded Volume/Actual Load)

Note: Assumes 90% ICE and 10% NYMEX market share in financial trading
¹ Only considers CBOT trading volume on futures products; half of the corn crop is traded 50x before delivery
² Volume from NYMEX and ICE Natural Gas Trading; broker OTC market estimated at 10% of total volume

Source: Dean & Company analysis, ICE, PJM, NYISO, MISO, ISO-NE, FERC EQR

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DC Energy
In fact, they should run to expanded markets.

Annualized Volatility by Products

Short Term – Balance of Day –

- Electricity: 243%
- Natural Gas: 97%
- Congestion: 426%

Medium Term – Monthly –

- Electricity: 95%
- Natural Gas: 59%
- Congestion: 257%

Long Term – Calendar Year –

- Electricity: N/A
- Natural Gas: 45%
- Congestion: 17%

Note: Power is based on the most liquid financial product (PJM Western Hub); Volatility represents buying and holding a PJM WH contract the day before, one month before, or one year before settlement; Volatility is measured by the standard deviation in returns on the holding period of 1 day (daily going to settlement) and one month for the monthly and annual contracts.

1 Annualized Volatility = Daily Volatility x \sqrt{n} where n = trading days in one year (255)
2 Annualized Volatility = Monthly Volatility x \sqrt{n} where n = trading months in one year

Source: ICE and DCE analysis.
Exchanges are developed around markets with a high number of suppliers, high price volatility, and low product differentiation.

### Commodity Comparison – U.S. View –

<table>
<thead>
<tr>
<th>Category</th>
<th>Corn</th>
<th>Oil</th>
<th>Natural Gas</th>
<th>Electricity</th>
<th>Coal</th>
<th>Paper</th>
<th>Shipping (Truck Freight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Physical Suppliers</td>
<td>41,000</td>
<td>7,730</td>
<td>7,730</td>
<td>1,997</td>
<td>1,190</td>
<td>561</td>
<td>112,642</td>
</tr>
<tr>
<td>• Physical Wholesale Buyers</td>
<td>5,415</td>
<td>4,836 + 3,216 (non-bulk)</td>
<td>2,376</td>
<td>72 + 7,325 (non-bulk)</td>
<td>313</td>
<td>13,395</td>
<td>16,504</td>
</tr>
<tr>
<td>• Exchange?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes, hub and basis</td>
<td>Limited</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Source: EIA, USDA, World Bank, US Census Bureau, Corn Refiners Association, Platts, DOE, NGSA, BTS, DC Energy data, Pulp & Paper
For example, PJM influenced the availability of monthly spread products through expanding the monthly FTR auctions to include the balance of planning period

**New PJM Markets**

– Expanding Options & Liquidity for Participants –

**Volume Traded**

– PJM Monthly FTR Auction –

- Introduction of a “cleared” spread product through the PJM FTR Auction for future months has increased trading in bilateral/broker markets

- Introduction of Balance of Planning Year strip FTR auction

**Total Volume Traded (GWh)**

*For example, PJM influenced the availability of monthly spread products through expanding the monthly FTR auctions to include the balance of planning period.*
The market has yet to converge on its most practical product

**Potential Market Scope**

- **Product/Times/Gaps**

  - **Time**
    - Multi-Year
    - RT/DA
    - Spread
  - **Products**
    - Energy
  - **Location**
    - Hub
    - Zone
    - Generator Nodes
  - **Exchange Requirements**
    - “One-to-One”
    - “One Too Many”

**Core Market Need**

**Gap** — Product/Times/Gaps — **Gap**
However, the expanded markets are not typical exchanges — which is the hedgehog and which is the fox?

**Different Exchange Types**

- **Classic Exchange**
  - Same product
  - Same location(s)
  - Same price
  - "One-to-one"

- **LMP Exchange**
  - Different products
  - Different locations
  - Different prices
  - "One-to-many" or (many-to-many)
What the market should provide to participants. Today is come close, but more is possible.

**Market Objectives**

- **Buy & Sell Power at Node(s)**
- **Hedged Price**

- **LT Power Price at Node**
- **Ability to Hedge**

- **Uncapped Price at Node**
  - To stimulate Demand Response
  - **Hedged Price**
    - To limit Risk

**LSE**
- **Muni**
- **IOU**
- **...**

**Generator**
- **Merchant**
- **Regulated**
- **...**

**Consumers**
- **Large (with metering)**
- **And small eventually**
- **...**

**Smooth earnings, certainty**

**Investment**

- **Efficiency**
- **Demand/response**
0. The Correct Exchange Design
   - LMP, “many-to-many” exchange competence

1. Staffing & Budgets
   - Budgets don’t devote sufficient resources to markets.
   - Whose money should be risked in developing new markets?

2. Governance
   - Governance focus on reliability

3. Incentives
   - Does it have the right incentives?

4. Regulation
   - Will it be regulated adequately for market products?

5. Innovation
   - Quick roll-out, willingness to experiment.
What is your wish list?

Key Questions

- What market is:
  - Adequate?
  - Desired?
  - Ideal?

- When do we need this market?

- Who can/should provide it?