We Knew All This

John A.C. Woodley
History repeats itself,
first as tragedy,
second as farce.

Karl Marx
The Old Paradigm

Least Cost Planning

Choosing the mix of resources that minimises the total cost of supply for the expected system load.

LCP is graphically illustrated here using a simplified system that can choose between two possible types of supply resource. Cumulative cost is the fixed capital cost plus the accumulated variable cost.
System Marginal Cost

Total Cost
Is the sum of the capital costs plus the unit operating costs.

Marginal Cost
Is the variable operating cost of the most expensive unit in dispatch at the time.

Equivalent Peaker
The sum of the capital cost of the lowest capital cost unit plus the marginal cost also equals the total system cost.
Flashforward: Spot Prices East and West

Day-ahead On Peak $/MWh

- Red: MIDCO
- Yellow: Cinergy

- $0 - $4,000
- 01/02/1997 - 01/10/2001
Flashforward: Spot Prices East and West

Day-ahead On Peak $/MWh (log scale)

- Cinergy
- MIDCO
Value of Lost Load

Finite Reliability

It requires an infinite amount of capital (reserves) to guarantee reliability. Thus a nonzero probability of outage is optimal.

Response: through survey, customers imply they would on average pay $8,000/MWh to avoid a summer outage. If “Peaker” costs $32,000 per MW per year in fixed costs then it is optimal to plan for (at least) 32/8 or 4 hours of lost load per year.
“Outage” Marginal Cost

Price Duration Curve

A few hours at very high prices. Many more at quite high prices but most in a relatively narrow range of much lower prices.

Doesn’t seem all that different to a competitive market except that the very high prices were never explicit and few (only really those customers on RTP or interruptible tariffs) could ever voluntarily sell into the high priced periods.
The Reasons for Deregulating

- More efficient allocation of capital, lower societal cost
  - Now: capital cost according to risk of specific use
  - Then: blended WACC of a vertically integrated utility for all uses

- Faster dynamic response, less supply-demand imbalance
  - Now: price provides a negative feedback signal
  - Then: price provides positive feedback

- Customised products
  - Now: retail price based on risk as well as load factor
  - Then: retail price almost solely based on load factor

The objective cannot just be summarised as “lower prices”
Rant – “If you pay, you can inconvenience me!”

- Why, when I choose to purchase,…
  - groceries I can save by using coupons?
  - travel I can save with a non-refundable ticket?
  - clothing I can save by waiting for sales?
  - a mortgage I can save with a variable rate loan?
  - cable I can save by choosing just basic cable?
  - I can also just avoid the hassle of saving?

- Why can’t I choose much of anything in electricity or gas except, possibly, the name at the top of my bill?

- Why am I the one who has to pay for the cost of peaking capacity that I would really just rather not use if I had the choice?
“Financial” Players

A Perspective on Roles
Trader Roles

- **Intermediator**
  - Provides customised contracts according to the different preferences of Buyers and Sellers

- **Price Insurer**
  - Assumes strategy risk
  - Assumes execution risk

- **Arbitrageur & Speculator**
  - Forces convergence
  - Provides liquidity
  - Keeps markets in balance
  - Ensures risks are efficiently priced and managed
### Intermediating

<table>
<thead>
<tr>
<th>Contract Property</th>
<th>Retailer Preference</th>
<th>Producer Preference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term</td>
<td>6 months to 2 years</td>
<td>3 to 15 years</td>
</tr>
<tr>
<td>Timing based on State of the Market</td>
<td>Low prevailing prices</td>
<td>High prevailing prices</td>
</tr>
<tr>
<td>Cost Structure</td>
<td>Fixed per MWh, no fuel or emissions component</td>
<td>Fixed per MW plus pass through on fuel and emissions costs</td>
</tr>
<tr>
<td>Delivery Profile</td>
<td>Shaped, as used, limited flexibility</td>
<td>Flexible, dispatch by buyer</td>
</tr>
<tr>
<td>Size</td>
<td>Small</td>
<td>Large</td>
</tr>
</tbody>
</table>
## Liquidity Providers (MWh & Market Share)

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2004</th>
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</thead>
<tbody>
<tr>
<td><strong>Enron</strong></td>
<td>590,203,540 (13.04%)</td>
<td>458,821,118 (7.53%)</td>
</tr>
<tr>
<td><strong>AEP</strong></td>
<td>401,303,435 (8.87%)</td>
<td>323,794,687 (5.31%)</td>
</tr>
<tr>
<td><strong>PG&amp;E</strong></td>
<td>283,028,196 (6.25%)</td>
<td>321,063,008 (5.27%)</td>
</tr>
<tr>
<td><strong>Duke</strong></td>
<td>276,239,139 (6.10%)</td>
<td>262,903,949 (4.31%)</td>
</tr>
<tr>
<td><strong>Reliant</strong></td>
<td>204,312,370 (4.51%)</td>
<td>239,798,839 (3.93%)</td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td>2,771,832,794 (61.23%)</td>
<td>4,489,943,260 (73.65%)</td>
</tr>
</tbody>
</table>

**Others:**
- AEP
- Morgan Stanley
- Exelon
- Calpine
- Others (73.65%)
When Risk Must Be Managed

Identify
Quantify
Assign
Manage
Evaluate

In-Source
• Culture
• Systems
• Policies
• Procedures

Out-Source
• Regulatory Environment
• Contract Technology
• Counterparty Credit
The Rich Uncle Problem - Risk

- **Heads**
  - You get $1,000,000

- **Tails**
  - You pay $900,000
# The Rich Uncle Problem

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Heads</th>
<th>Tails</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MS Payout</strong></td>
<td>$(959,500)$</td>
<td>$940,500</td>
</tr>
<tr>
<td>0.505</td>
<td>$1,900,000</td>
<td></td>
</tr>
<tr>
<td><strong>Payout from Estate</strong></td>
<td>$1,000,000</td>
<td>$(900,000)</td>
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<tr>
<td><strong>Result (Net)</strong></td>
<td>$40,500</td>
<td>$40,500</td>
</tr>
</tbody>
</table>
Plant/Fleet Financing

Owner
WACC 12%

Unhedged
$7.5M

Hedged
$9.1M

Commercial Bank

LC Payment Guarantee

Morgan Stanley

Owner
WACC 9%

buys LC

Toll

Note: All parties are subject to risk/return constraints on capital used.
Forward Contracts and Capital Cost

- **Texas Genco** *(Blackstone, Hellman & Friedman, KKR, TPG)*
  - Sr Secured Credit Facility and High Yield Bond Financing
  - Sr Secured Notes of $1.125b 4x oversubscribed
  - ~57 TWh over 4 years by Morgan Stanley and Goldman Sachs

- **Coleto Creek** *(Sempra, Carlyle)*
  - 300MW UC offtake for 3 years

- **CalGen** *(Calpine)*
  - Refinanced $2.405b
  - 3 year guarantee on minimum portfolio revenues
  - Prior attempt failed just days before for lack of guarantee