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Re-thinking Electricity Markets

Data You Can Believe In!

Planning, Markets & Change in the Electricity Supply (Demand?) Industry

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NYISO New York Independent System Operator

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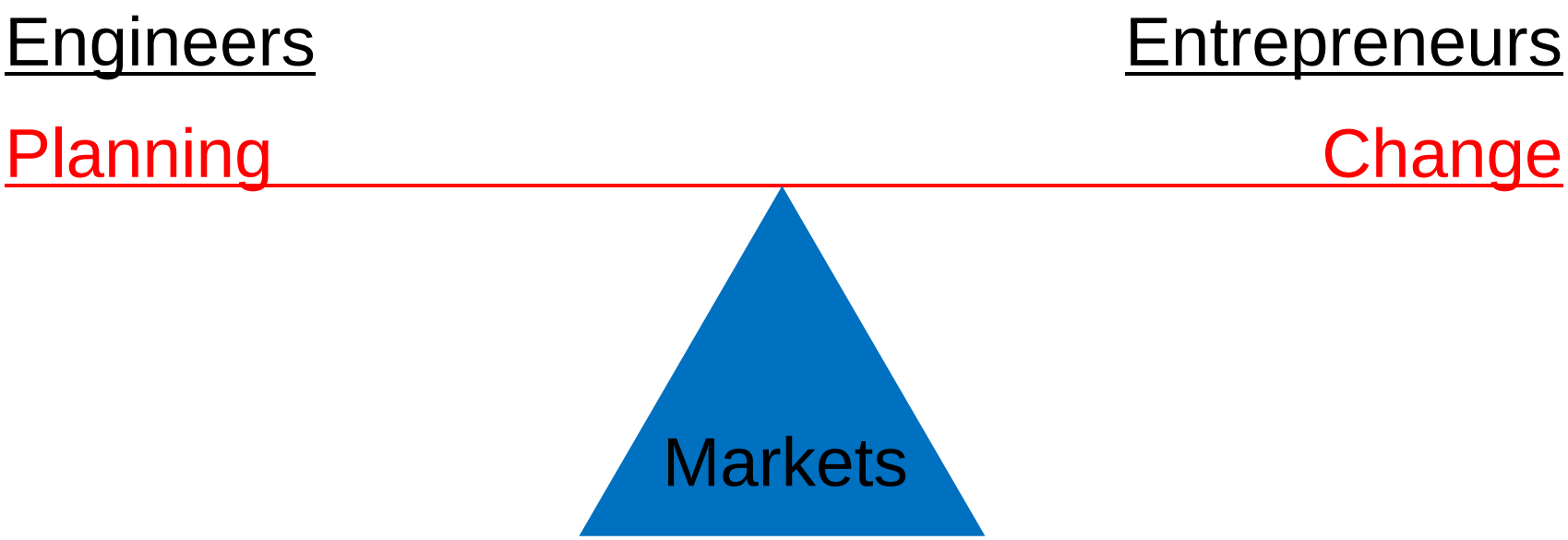
"Put your money where your mouth is!"

Extracting data to balance interests:



Customers (Loads?)

ISO New York Independent System Operator

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Contradictions in Mindset

- Static vs. Dynamic vs. Evolutionary
- Variables (controls) vs. Parameters (givens)
- Engineers' Controls = Economists'

  Parameters (and Vice Versa)

  + Uncertainties

- How and When Will "Facts" Become Known?
- Will "Facts" Follow From the Path Trodden?

Particulars of Electricity Systems

- Scale and Long Lead Times for Planning & Construction.
- Delivery over a Network (externalities).
- Limits to Inventory (little storage).
- Reliability as an Entitlement (and Public Good).
- Many Changes (Uncertainty) over both Space and Time.

What Data Don't We Know Now?

- Costs of Suppliers
- Desires of Customers
- Future Prices (of Fuel, etc.)
- Technological Innovations
- Changes in Grid Structure and Configuration
- Exogenous Disruptions (solar storms?)

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Markets as "Truth-Revealing" Mechanisms

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- If "Private" Goods
- If Markets are Competitive

  - - *but, Electricity satisfies neither criterion completely (particularly with reliability provided over a network).*

All markets are compromises!

(Nobody's Perfect.)

Market Design & Evolution

Markets are Discrete but Buyers and Sellers Differ Continuously, so Design Market Structure to Minimize:

- Efficiency (MB=MC) Loss => smaller mkt. size
- Transactions Costs => larger mkt. size
- Arbitrage Costs => smaller mkt. size
- Market Power => larger mkt. size

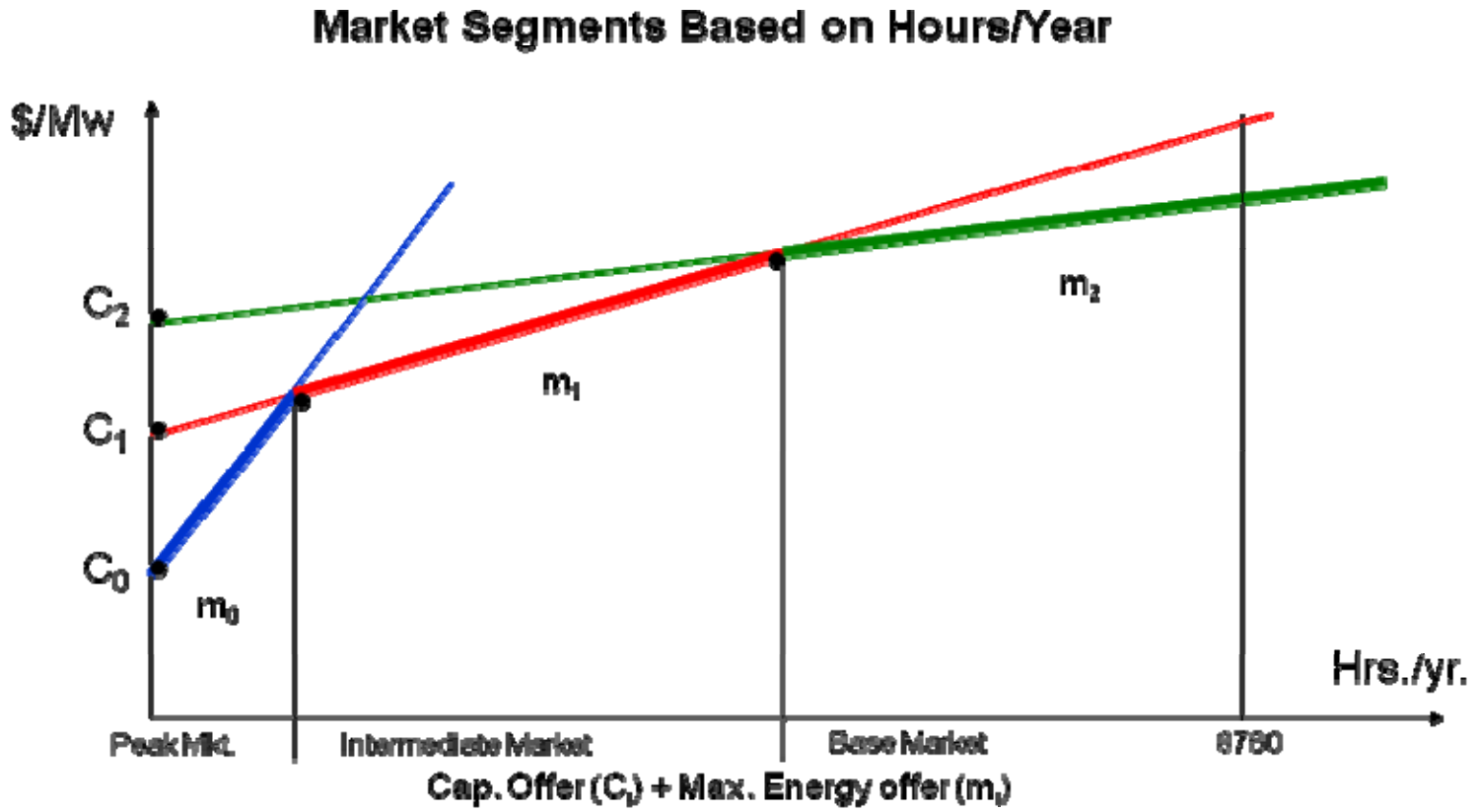
Additional Market Design Concerns

- How and When are Market Structures to be Revised (based on new data)?

- Policy Principle: The Number of Instruments MUST Equal the Number of Objectives!

  (both Buyers and Sellers must face two Prices)

Example of two-part Offers for Capacity and Energy



Additional Challenges

1) Smooth "Corn and Hog Cycles" of Investment (and Prices) through Forward Markets.

- Congestion (Use congestion prices to signal need for capacity investment and to moderate 1.)

2) Internalize Externalities:

- Pollution (Use environmental adders to re-connect buyers to nature through dynamic prices.)

First Step

- Stop Treating customers as "LOADS"!
- Make Real-Time, Dynamic Pricing available to all.
- One-sided Markets are STUPID, and so is a one-sided power grid.

- - but - - consider customers' and suppliers' privacy issues with all that data in the "clouds".

Stealth Agenda

- With Externalities Priced -
- With Buyers and Sellers Informed –

Could the truly smart grid be a pathway toward sustainability?

- The data and incentives would be there.
- The transport system is in place.
- The flexibility is there.