# Electricity Restructuring: Success or Failure?

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# OUTLINE


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  - Goals of Deregulation
  - Analysis of Retail Electricity Prices
  - Customers have not benefitted from Deregulation
  - BUT Some Electric Utilities are Highly Profitable
  - Where Have the Profits Gone?
  - Where Should the Profits Go?
  - Are we Prepared for a Future Low-Carbon Economy?

# Three Goals of Deregulation

- Greater Economic Efficiency

  (by Reducing Production Costs)
- Lower Rates for Customers

  (by Passing on the Cost Savings)
- More Innovation in Technology

  (by Encouraging New Firms to Enter)

# An Econometric Analysis of Retail Electricity Prices


- Annual, state-level data for all REGULATED states (except Alaska, Hawaii, Nebraska and Utah) and all deregulated states prior to the creation of restructured wholesale markets are used to predict the AVERAGE RETAIL PRICES OF ELECTRICITY paid by Residential Customers and by Commercial/Industrial Customers.

- The explanatory variables in the models are the Fuel Mix of Generation, Fuel Prices, NERC and ISO Regions, Efficiency Improvements, Nuclear Ownership and Depreciation of the Book Values of Nuclear Capacity.

- The estimated models are used to predict the AVERAGE RETAIL PRICES in states with restructured wholesale markets (i.e. these are the predicted prices assuming that DEREGULATION HAD NEVER HAPPENED).

- Compare these PREDICTED prices with the ACTUAL prices after deregulation.

# Comparison for Residential Prices

## 100(Actual – Predicted)/Predicted

| Year | CAISO | PJM | ERCOT | ISO-NE | NYISO |
|---|---|---|---|---|---|
| 1996 | 0.62% | | -4.31% | | |
| 1997 | 2.13% | 0.41% | -3.69% | -0.34% | |
| 1998 | -5.70% | -0.42% | -3.77% | -1.79% | -1.94% |
| 1999 | -5.49% | -4.05% | -5.86% | -4.46% | -5.48% |
| 2000 | -2.94% | -7.01% | -3.16% | -9.19% | -2.51% |
| 2001 | 11.02% | -5.56% | 11.59% | -10.35% | -0.28% |
| 2002 | 15.96% | -4.11% | -6.29% | -3.13% | -4.51% |
| 2003 | 13.56% | -3.19% | 7.64% | -10.52% | 1.63% |
| 2004 | 12.34% | -1.91% | 15.42% | -6.56% | 2.47% |
| 2005 | 5.13% | 0.63% | 22.95% | -4.95% | 5.29% |

Predicted REGULATED Prices LOWER than the Actual DEREGULATED Prices are RED

"Counterfactual Forecasts of the Retail Prices of Electricity in Regions with Restructured Wholesale Markets" John Taber and Tim Mount, Presented at the 27th Annual Eastern Conference of the Rutgers CRRI, May 2008.

# Comparison for Commercial/Industrial Prices

## 100(Actual – Predicted)/Predicted

| Year | CAISO | PJM | ERCOT | ISO-NE | NYISO |
|---|---|---|---|---|---|
| **1996** | -7.68% | | -3.18% | | |
| **1997** | -7.75% | 6.24% | -2.64% | -0.96% | |
| **1998** | -12.28% | 3.40% | -1.93% | 3.05% | -4.07% |
| **1999** | -12.64% | -2.19% | -1.54% | -0.88% | -13.46% |
| **2000** | -6.94% | -8.03% | 2.21% | -8.60% | -2.70% |
| **2001** | 19.33% | -7.17% | 24.81% | -6.91% | -0.37% |
| **2002** | 32.68% | -9.73% | -6.85% | 3.80% | -4.01% |
| **2003** | 27.70% | -7.56% | 8.14% | -5.42% | 7.31% |
| **2004** | 19.93% | -1.33% | 16.81% | -1.02% | 7.84% |
| **2005** | 18.50% | 6.00% | 36.38% | 1.23% | 16.25% |

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# Econometric Results

- In most states with restructured wholesale markets, retail prices after restructuring were determined by “transition” prices, but more recently, the market prices are high because they are now determined by the high marginal prices of natural gas rather than the average cost of production.

- By the end of the sample period (2005), only Residential Customers in New England were paying a retail price that is LOWER than the price predicted as though deregulation had never occurred.

- The evidence from this analysis implies that most customers have NOT benefitted from the deregulation of wholesale markets for electricity, but many other studies have shown that there have been improvements in economic efficiency (e.g. nuclear power plants).

# Some Generating Companies in Deregulated Regions are Very Profitable

| Type of Generator | Capital Cost ($/kW/Year) | Net-Profit Low Cost of Natural Gas ($/kW/Year) | Net-Profit High Cost of Natural Gas ($/kW/Year) |
|---|---|---|---|
| 1. Peaking | 80 | -80 | -80 |
| 2. Shoulder | 159 | -80 | 78 |
| 3. Baseload | 238 | -80 | 117 |

In a regulated market, buyers pay the AVERAGE COST, but in a deregulated market, buyers pay the MARGINAL COST. The recent increase in the price of natural gas has resulted in windfall profits for the owners of baseload capacity (nuclear, hydro and coal) in deregulated markets.

References can be found in a summary report by the APPA on the Electricity Market Reform Initiative (EMRI) <http://www.appanet.org/aboutpublic/index.cfm?ItemNumber=16772>.

1) “Problems with Capacity Markets; Why are Customers Paying so Much and Getting so Little in Return?”, Tim Mount.
2) “The Electric Honeypot: The Profitability of Deregulated Electric Generation Companies”, Edward Bodmer.

# ANY SIGN OF INNOVATION?

**Reduce the Global Emissions of Carbon by 80% to Meet the Goals of Climate Change: What will the Electric Delivery System Look Like?**

# Current Federal Policy Initiatives

- Electricity Generation (40% of total direct energy)
  - Nuclear
  - Carbon Capture and Sequestration
  - Deep-Well Geothermal
  - Large Scale Renewables
- Transportation (30% of total direct energy)
  - Liquid Biofuels
- Buildings (10% of total direct energy)
  - Energy Star Appliances
- Keep the Existing Structure of Delivering Energy Services
  - Central Power Plants
  - Liquid Fuels for Transportation

# It's not Enough. What's Missing?

- Generate Electricity from Distributed as well as Large Scale Renewable Sources
  - ONE unit of electrical energy from a renewable source replaces THREE units of energy from coal in a power plant
- Switch Transportation to Electric Motors
  - ONE unit of energy from a battery in a PHEV charged using a renewable source replaces FIVE units of energy from gasoline or E85
- Use Ground-Source Heat Pumps for Cooling and Heating Buildings
  - Replace the direct use of fossil fuels for heating by electricity from a renewable source and make air conditioning more efficient

# Likely Implications

- Electricity will displace most Fossil Fuels for Delivering Energy Services.
- Wind and Solar (and Nuclear?) will be the Dominant Sources of Energy for Generating Electricity.
- Storage Devices (e.g. Batteries in PHEVs and Thermal Storage) will be Needed to Compensate for the Intermittent Supply from Renewable Sources
- Distributed Energy Resources and Dispatchable Loads will be More Important Components of the Electric Delivery System and Require SmartGrid Capabilities and MicroGrids.
- Aggregators will act as Single Customers on the Bulk Power Grid at the Substation Level.

# Will Deregulation Help The Transition to a Low-Carbon Economy?

- There is evidence from other studies that gains in economic efficiency have occurred in electric utility industry.
- Our analysis concludes that these lower production costs have not been passed on to customers as lower retail rates.
- Where have the profits gone? Mainly to buying existing assets and not to innovation? Profits are now fungible and customers no longer know exactly where their rates are going.
- Why are electric utilities different from telephones? There are more public goods associated with the transmission grid.
- A low-carbon economy will need a major overhaul of the grid to support Distributed Energy Resources (DER, e.g. MicroGrids) effectively.
- There is no financial incentive for profitable generators to invest in these new innovative network capabilities.
- Public money will be needed to develop a smart network that can support DER, and this will provide the means for additional innovation.

# The Google Campus, Santa Clara CA

## An Example of Innovative DER

**WE REALLY DO NEED A COMPREHENSIVE NATIONAL PLAN FOR ENERGY.**