

# **Convergence of the Gas and Electric Industry: The Role of the Advanced Turbine Systems**

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## **Abstract**

The impact of electric deregulation at both the state and Federal levels will have profound effects upon future generations of electric-generation equipment. The competition caused by the deregulation of the electric industry will cause the industry to seek new more-efficient lower-cost generation. This effect can be seen in almost all deregulated industries, most noticeably airlines and telecommunications. Furthermore, the electric industry is going through a convergence process that is blending fuel and electricity into a Btu commodity, because of (1) the availability of new efficient low-cost turbines, (2) the relative cleanliness of natural gas as a fuel, and (3) the fungibility and liquidity of gas and electricity through large-scale energy trading companies.

Many existing combined gas and electric utilities have capitalized on their converged capabilities for years. Converged companies will succeed their capabilities on a national scale as deregulation accelerates. These factors will push converged companies to seek to embed options in their national strategies that will include the physical capabilities of the power plants they own or control. The next generation of turbines must not only be bigger, cheaper, more reliable, and more efficient, they must also be extremely flexible to provide the owner the maximum opportunity to arbitrage across energy form.



# ***Convergence of the Gas and Electric Industry: The Role of the Advanced Turbine Systems***

*Advanced Turbine Systems  
Annual Program Review Meeting  
Morgantown, WV  
October 28, 1997*

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# *Issues to Consider*

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- Life cycle of deregulation
- Are convergence transactions form or substance?
- Generation requirements in a deregulated and converged industry

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# *Deregulation*

# ***The Pace Accelerates . . . But Many Tough Issues Have Yet to Be Decided***

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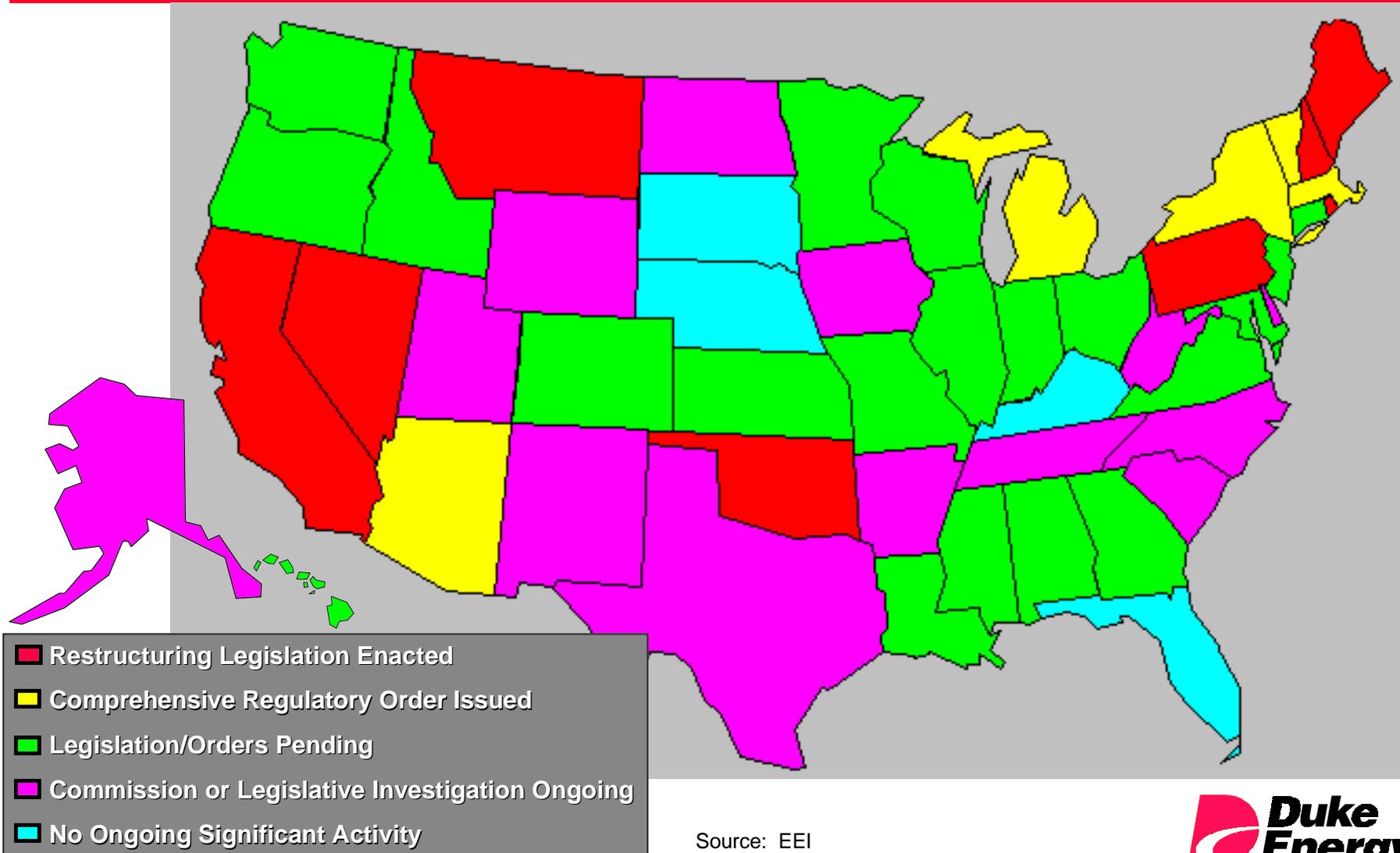
## *Federal*

- **Codification of bulk transmission capacity rights**
- **Mandate of ISO's**
- **Elimination of PUHCA**

## *States*

- **Timing and method of phasing out rate base treatment for generation**
- **Prudently incurred cost standard for stranded cost recovery**
- **Extent and timing of full retail competition**

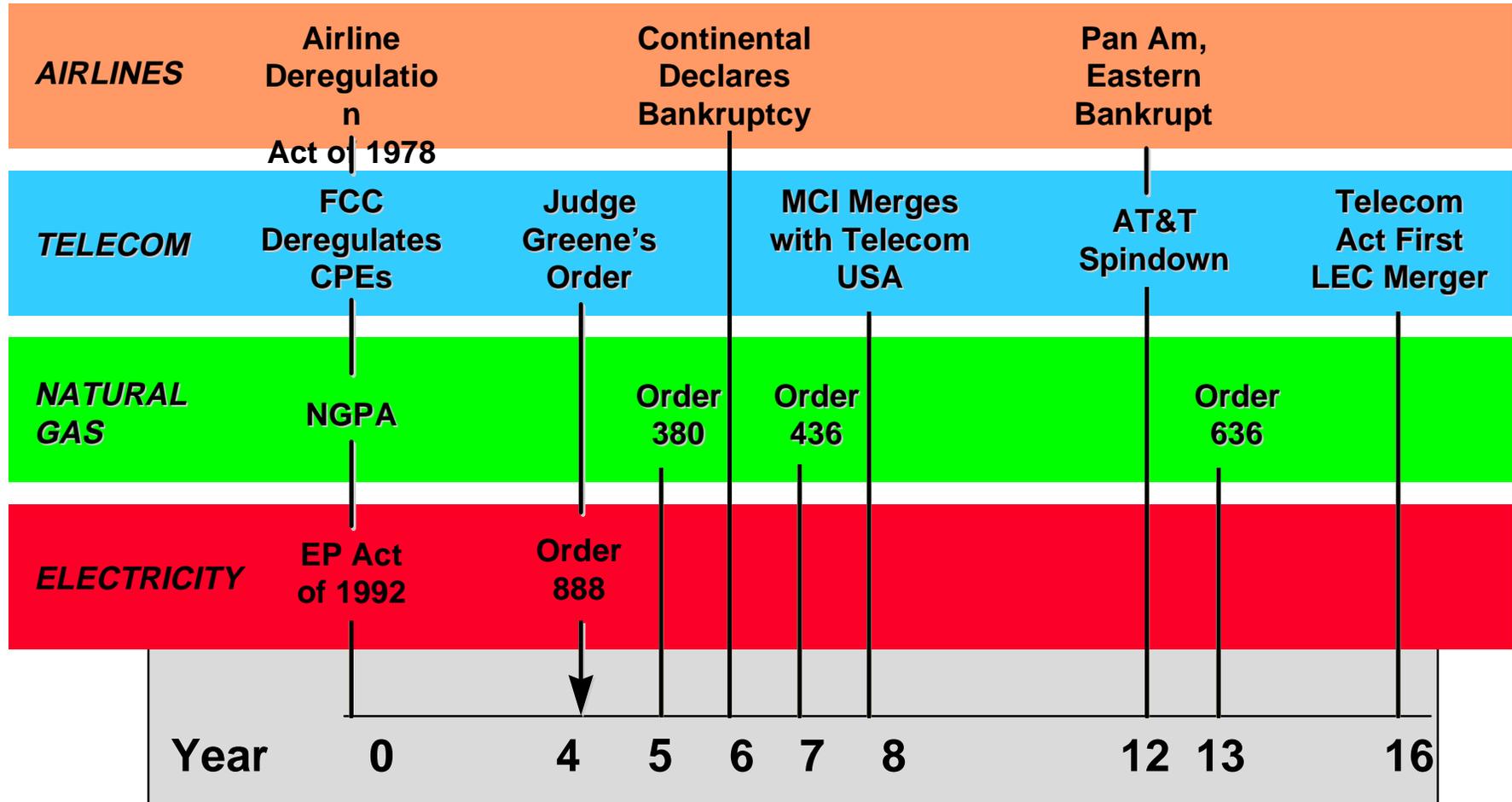
# Progression of State Deregulation Initiatives



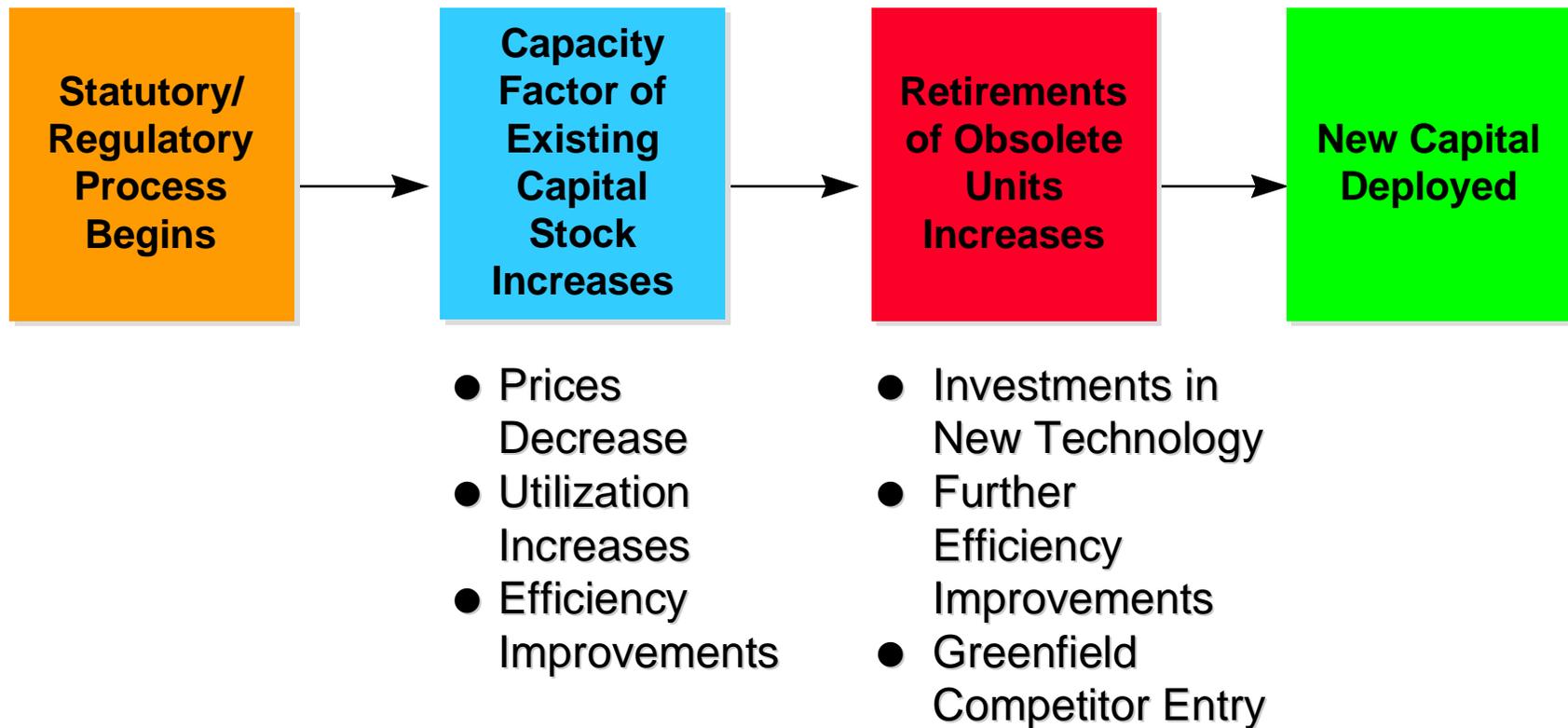
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Source: EEI

# Life Cycle of Deregulation



# *Investment Life Cycle of Deregulating Industries*



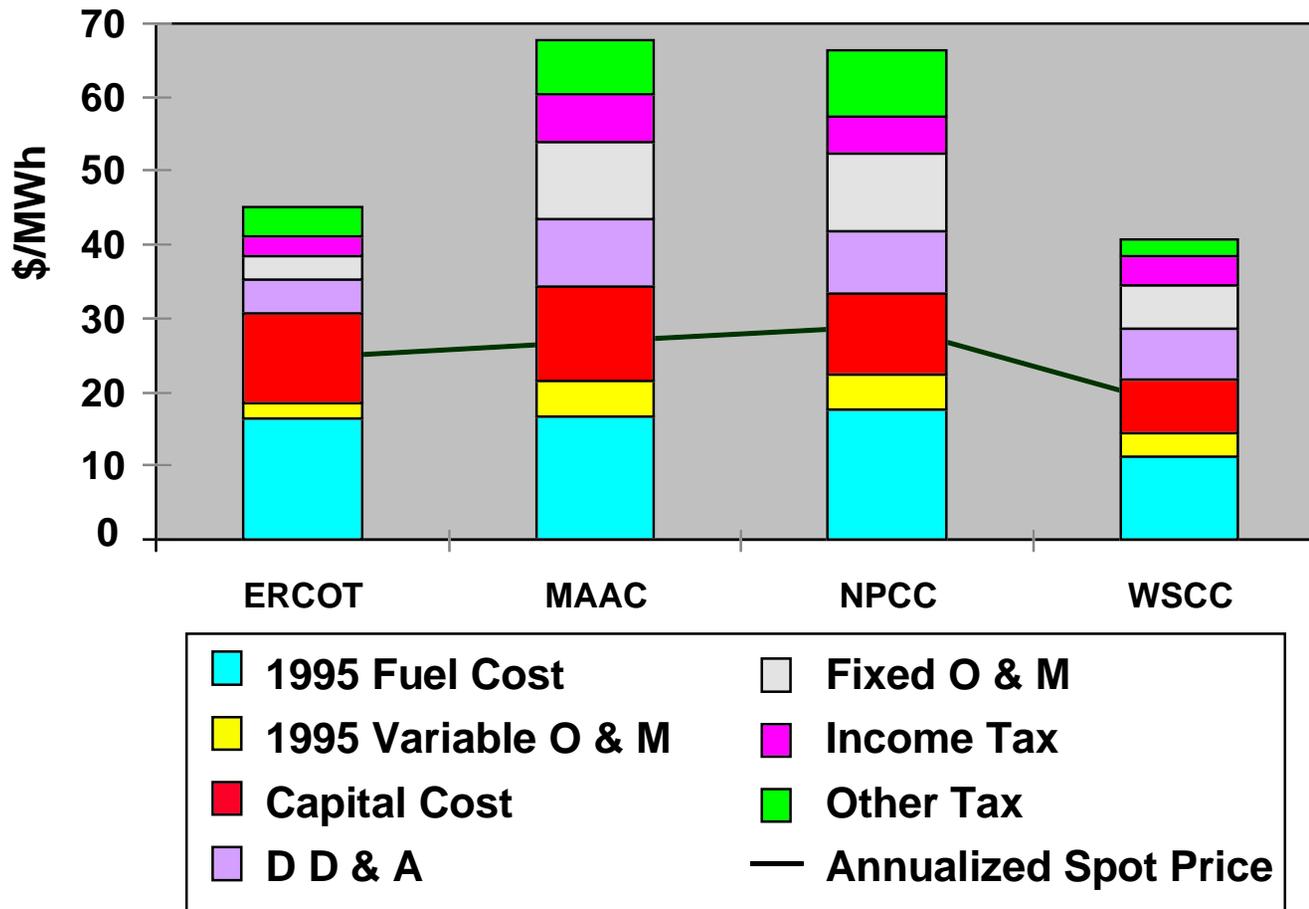
# *Observations on Life Cycle Progression*

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- Asset activity is moving surprisingly early in process
- Valuation subject to significant uncertainty
- New technology will challenge preexisting capital stock
- Ultimately \$77 billion invested in publicly-owned electric generation at significant devaluation risk
- Near term effect is gradual deterioration of credit quality of public power debt

# In a Fully Competitive Market, Even Variable Operating Costs May Not Be Fully Recovered

Total Recovered Cost of Generation vs. Spot Power Prices by Selected Regions



Source: Power Markets Week

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# *Convergence*

# *Spectrum of Transactions To Be Considered*

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Least

Most



**Alliance  
with Major  
Marketer**

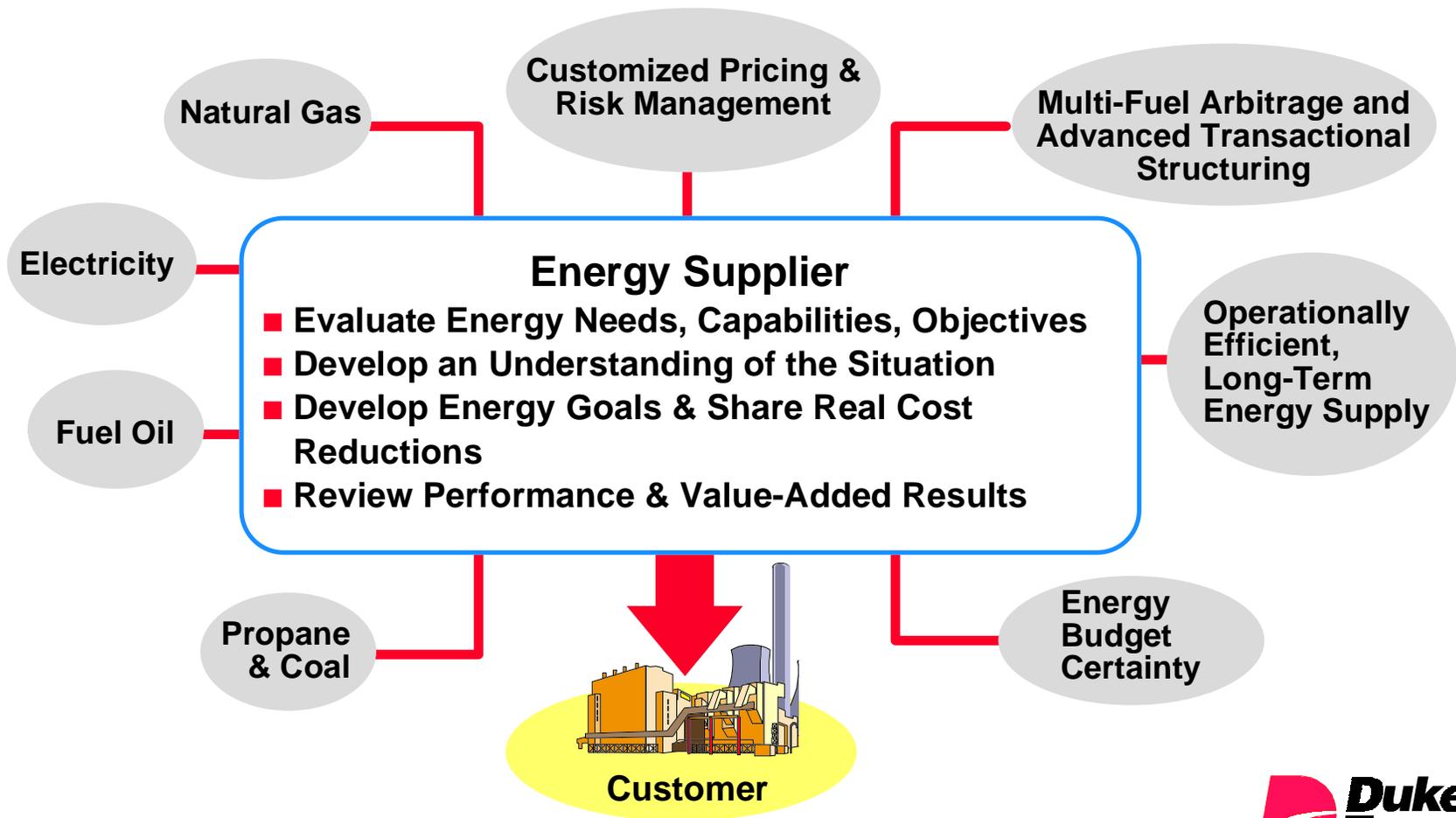
**Energy  
Management  
Agreement**

**Structured  
Lease  
Transaction**

**Asset  
Monetization**

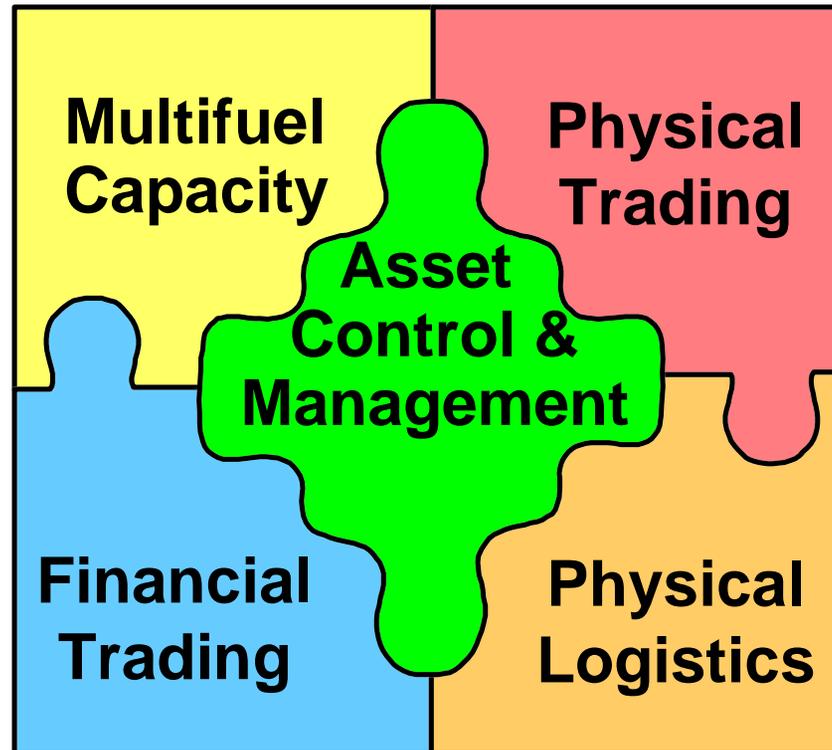
# One-Stop Shop: The Converged Energy Supplier

- Build significant portfolios of scale, scope and diversity
- Acquire complex management skills and capabilities

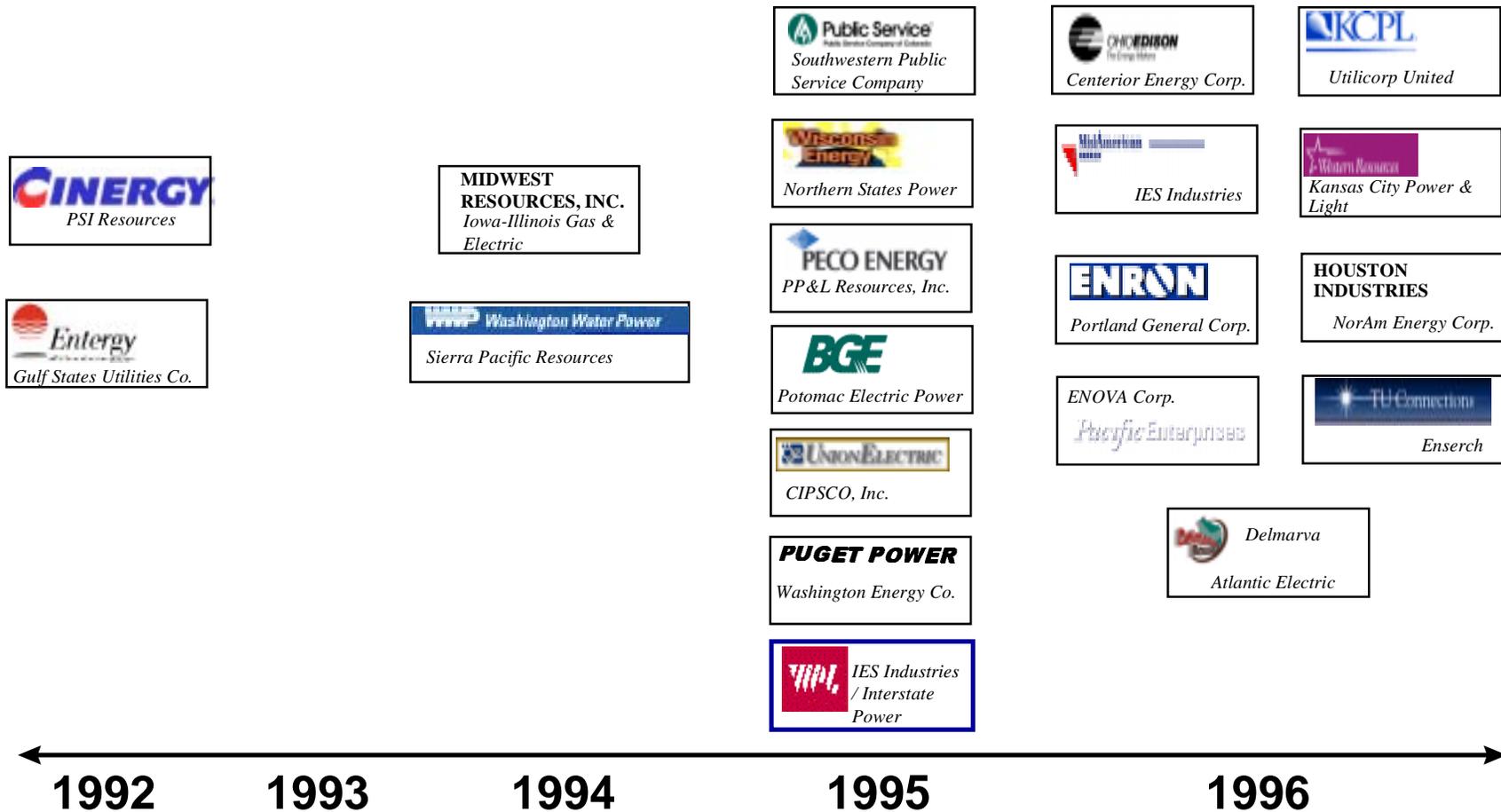


# ***Successful Players Will Put the Energy Puzzle Together***

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# Merger Activity Since EPAct of 1992



# *Observations*

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- Power Marketer volumes have grown substantially such that some marketers have now demonstrated superior skills to those of utility competitors
- Those with significant pre-existing national or regional gas marketing business continue to dominate the market
- Marketing practices continue to promote greater efficiencies in power production, but many economies will be illusory under conditions of full competition

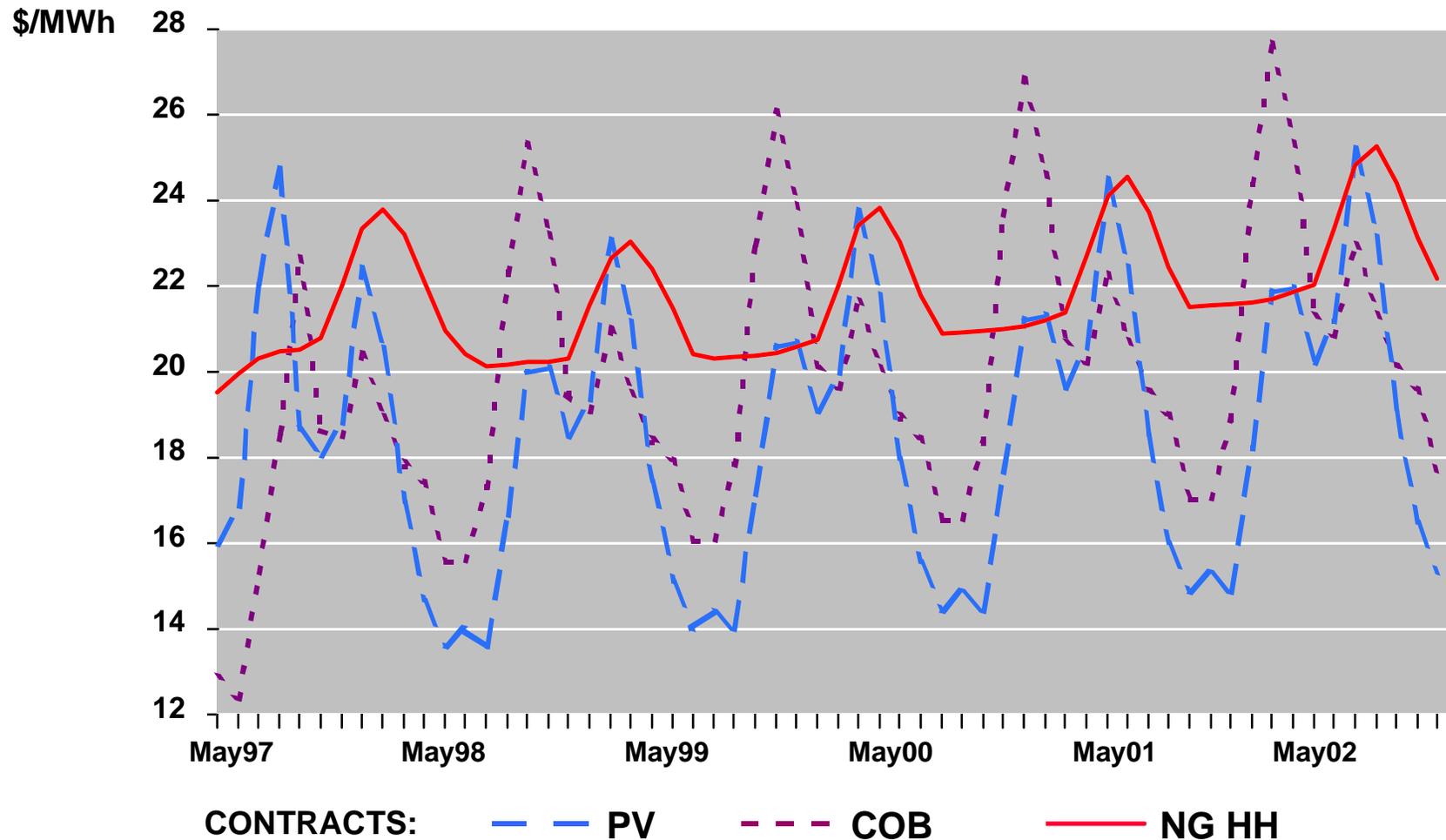
# *National Trading Companies Predominate in Market*

## Top 10 Power Marketers

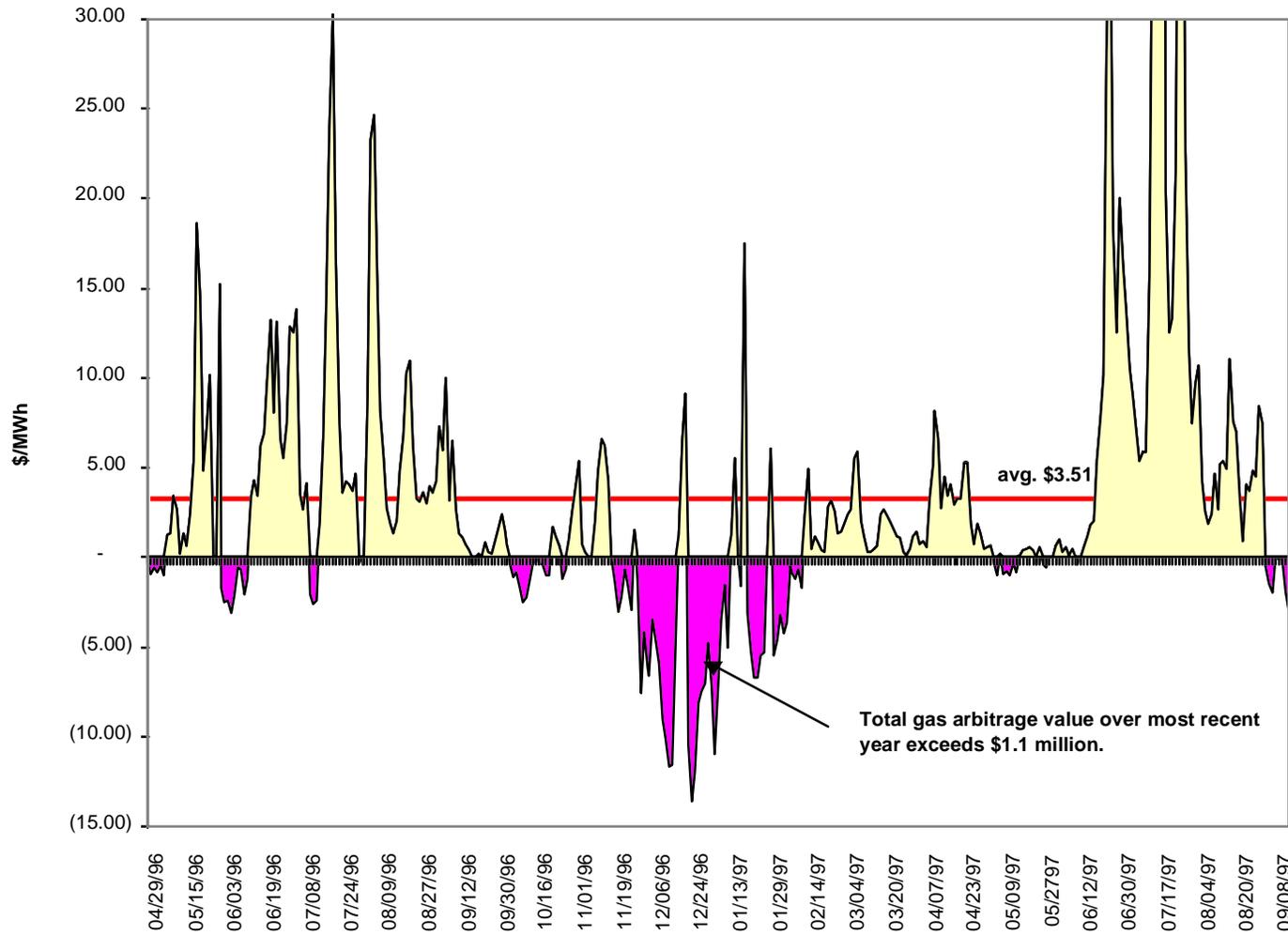
<u>Rank</u>	<u>Company</u>	<u>2Q97 Quarter Sales (MWh)</u>
1	Enron	37,689,072
2	<b>Duke Energy*</b>	<b>17,698,687</b>
3	Electric Clearinghouse	16,342,031
4	Vitol Gas & Electric	12,475,786
5	Aquila Power	11,747,439
6	Southern Energy Mkt.	10,621,203
7	LG&E Power Marketing	9,458,642
8	Illinova Power Mkt.	7,986,208
9	Engage Energy	7,528,230
10	Entergy Power Mkt.	7,298,161

\* Combined trades for Duke/Louis Dreyfus and PanEnergy Trading and Marketing, LLC

# Forward Contracts: Electricity & Natural Gas



# Illustration of Arbitrage Values in SPP Based on Spark Spread



# ***Closing Observations***

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## **Bottom Line: Market Immaturity**

- Power marketer volume growth not accompanied by rationalization of asset values or forward market liquidity
- Retail strategy for electricity at odds with gas experience suggesting the proof is not yet forthcoming
- Wholesale convergence appears more solidly rationalized, but national scale is elusive
- Capital markets, technology, and timing are all wild cards

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# *Generation*

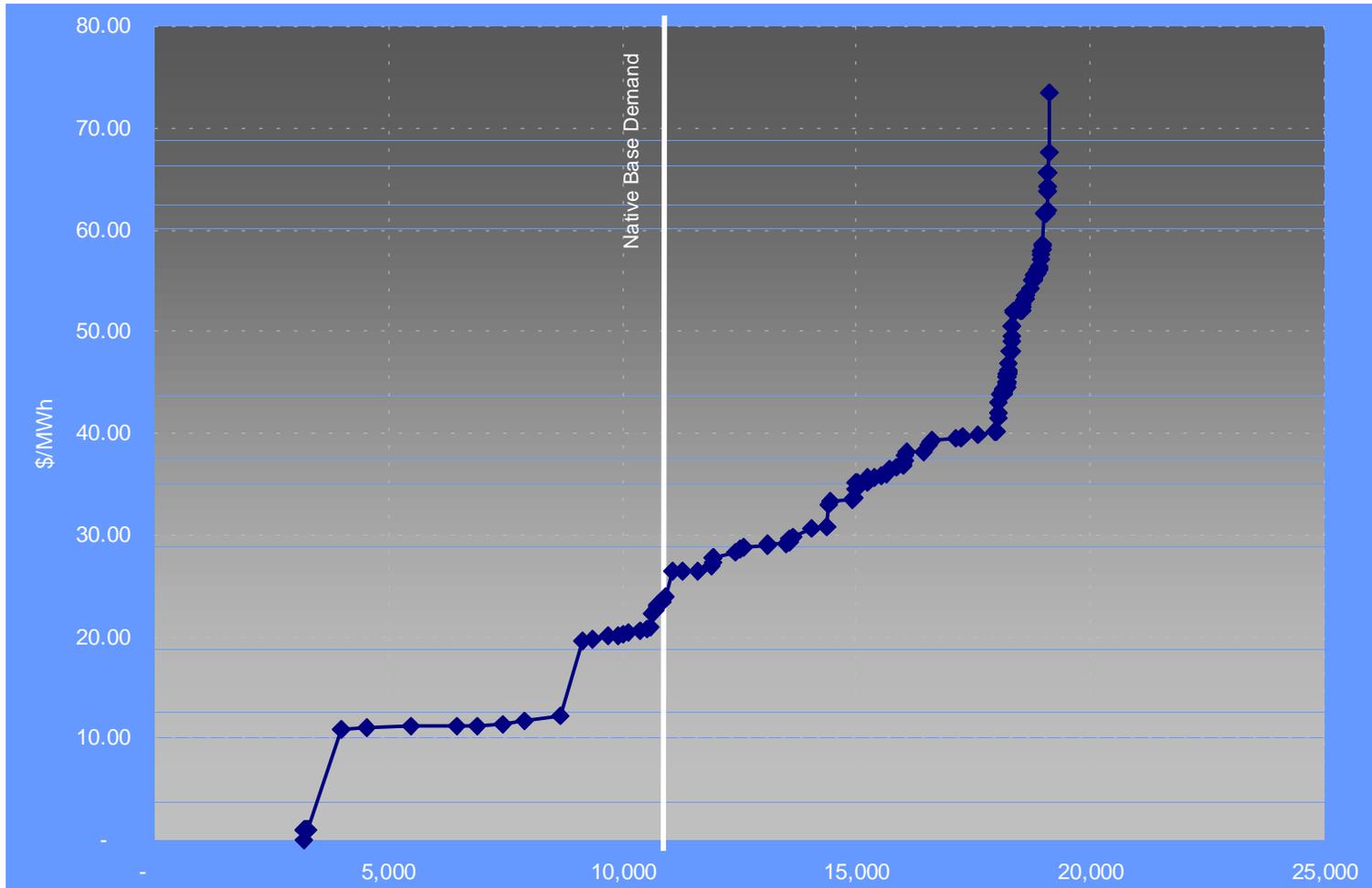
# *Gas Turbine Improvements*

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- Heat rate improvements
  - Simple-cycle gas turbine heat rates
    - ◆ 1970: 11,900 Btu/kWh
    - ◆ 1992: 9,000 Btu/kWh
  - Combined-cycle gas turbine heat rates
    - ◆ 1996: 6,700 Btu/kWh
  - Superior load-following capability

# Northeast Supply and Pricing

(at 100% of Summer Capacity) - Base Case



# ***Future Gas Turbine Requirements***

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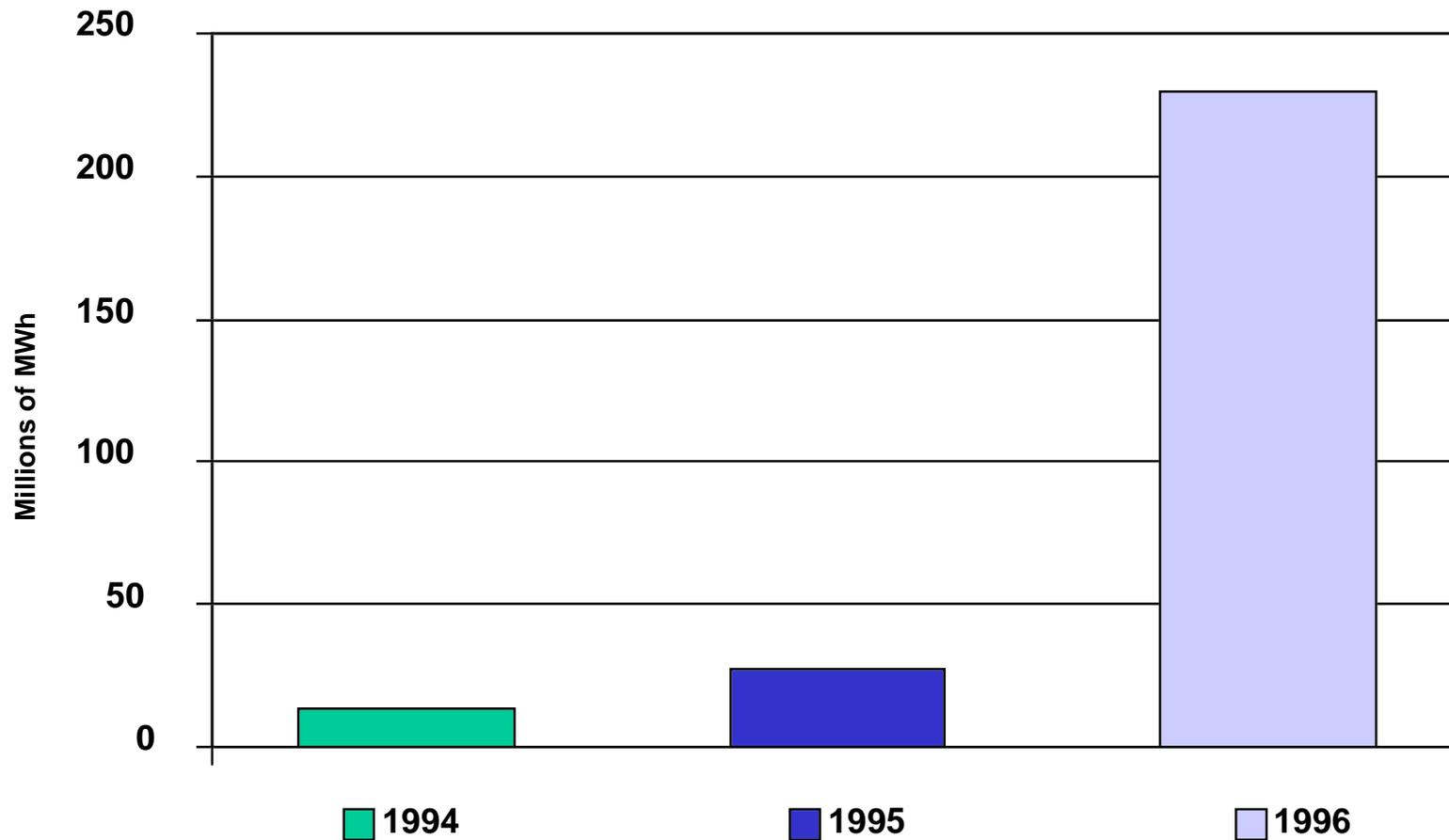
- Flexibility to capture arbitrage
- Reliability to serve market requirements
- Efficient to beat incumbent resources
- Cost competitive to allow repatriation of capital

# *Conclusion*

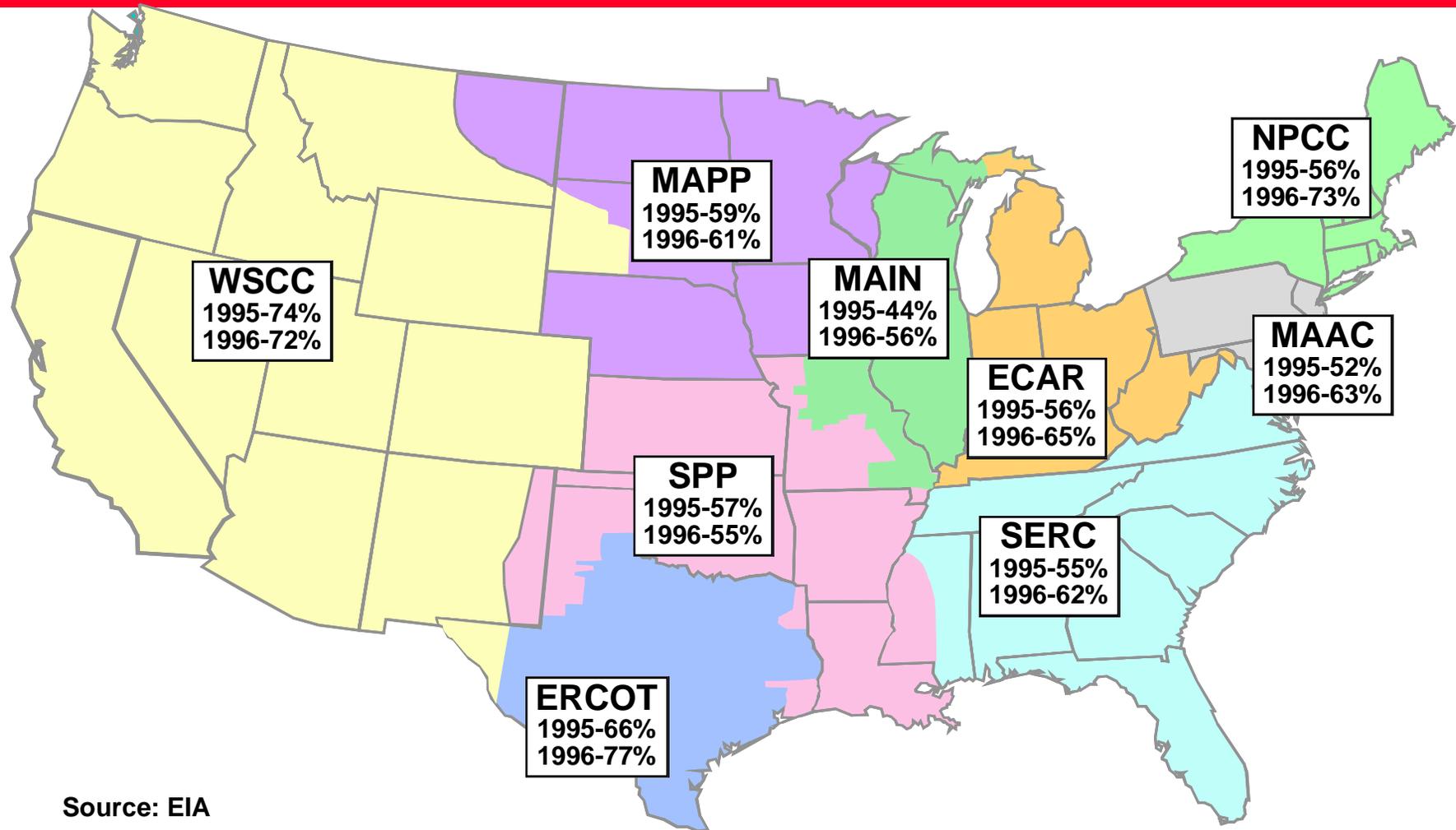
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**Doing nothing is to accept risks  
you have never before had.**

# Power Marketer Volumes 1994 - 1996

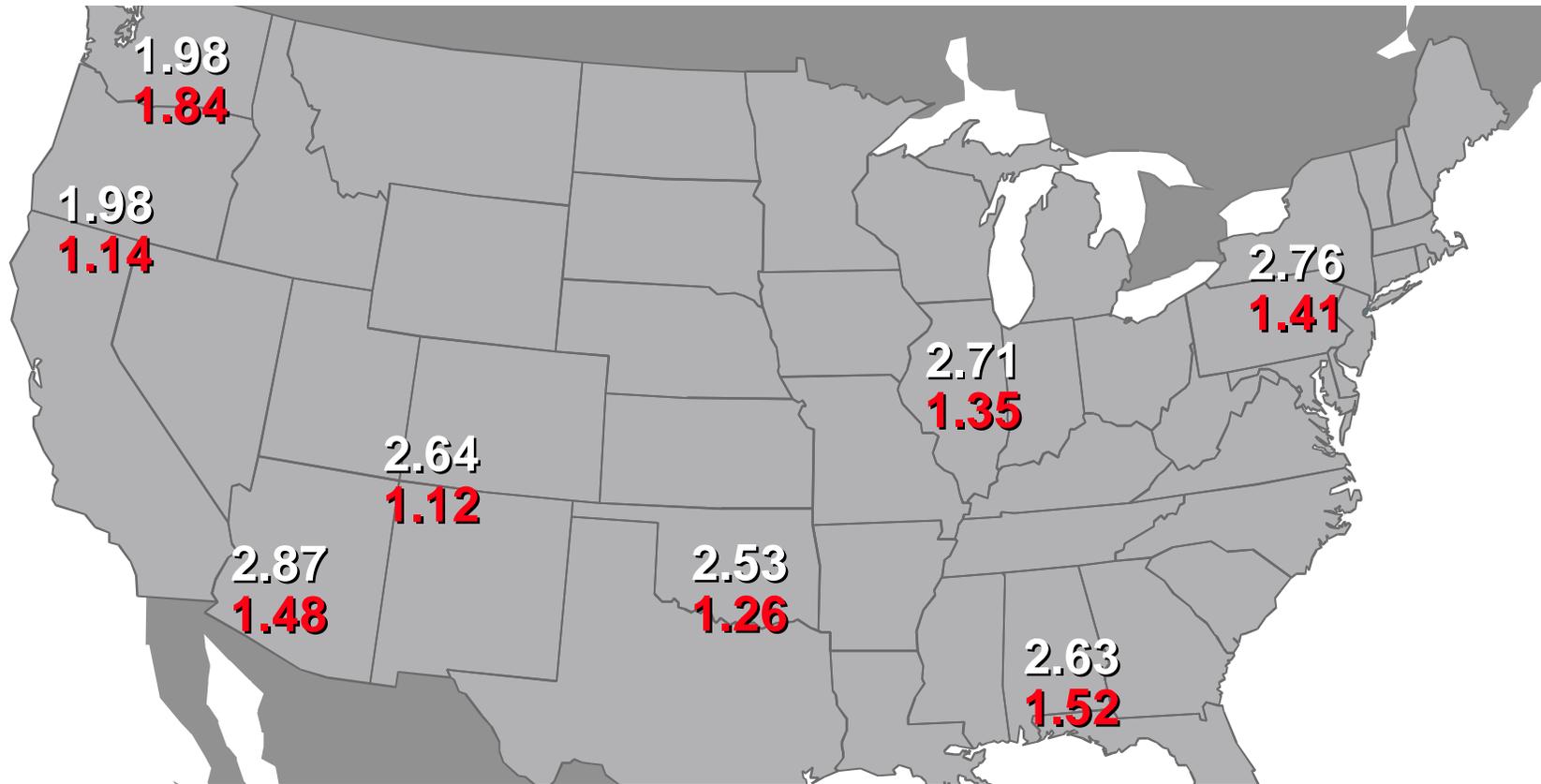


# 1995 and 1996 Capacity Factors for Coal Plants



Source: EIA

# Regional Price Comparison for Gas and Coal (Summer)



Gas (\$/MMBtu)  
Coal (\$/MMBtu)

Prices to City Gates or Large End-users Sept. 5, 1997  
Average Delivered Price to Utilities March, 1997

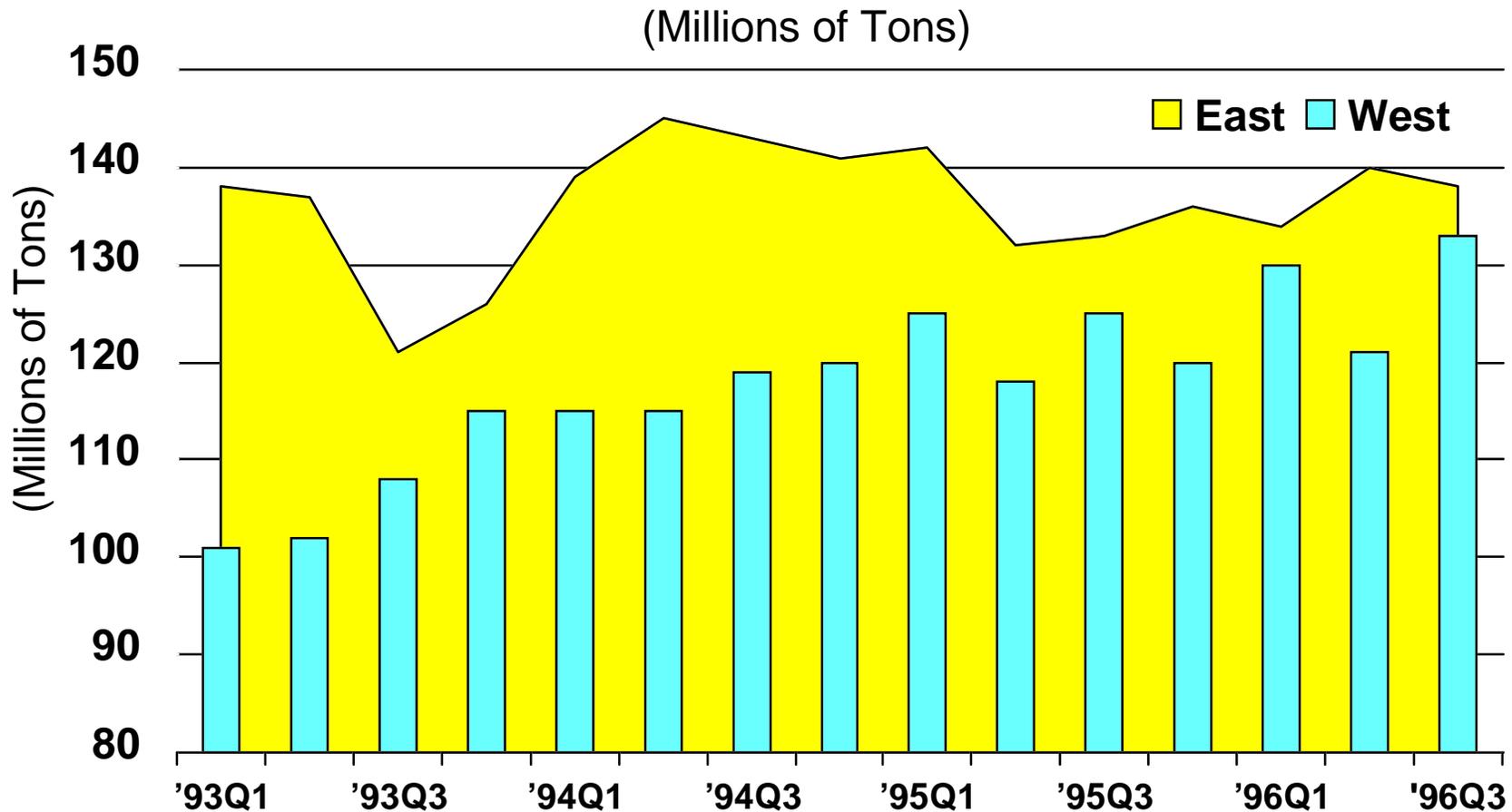
Sources:  
Power Markets Week & EIA



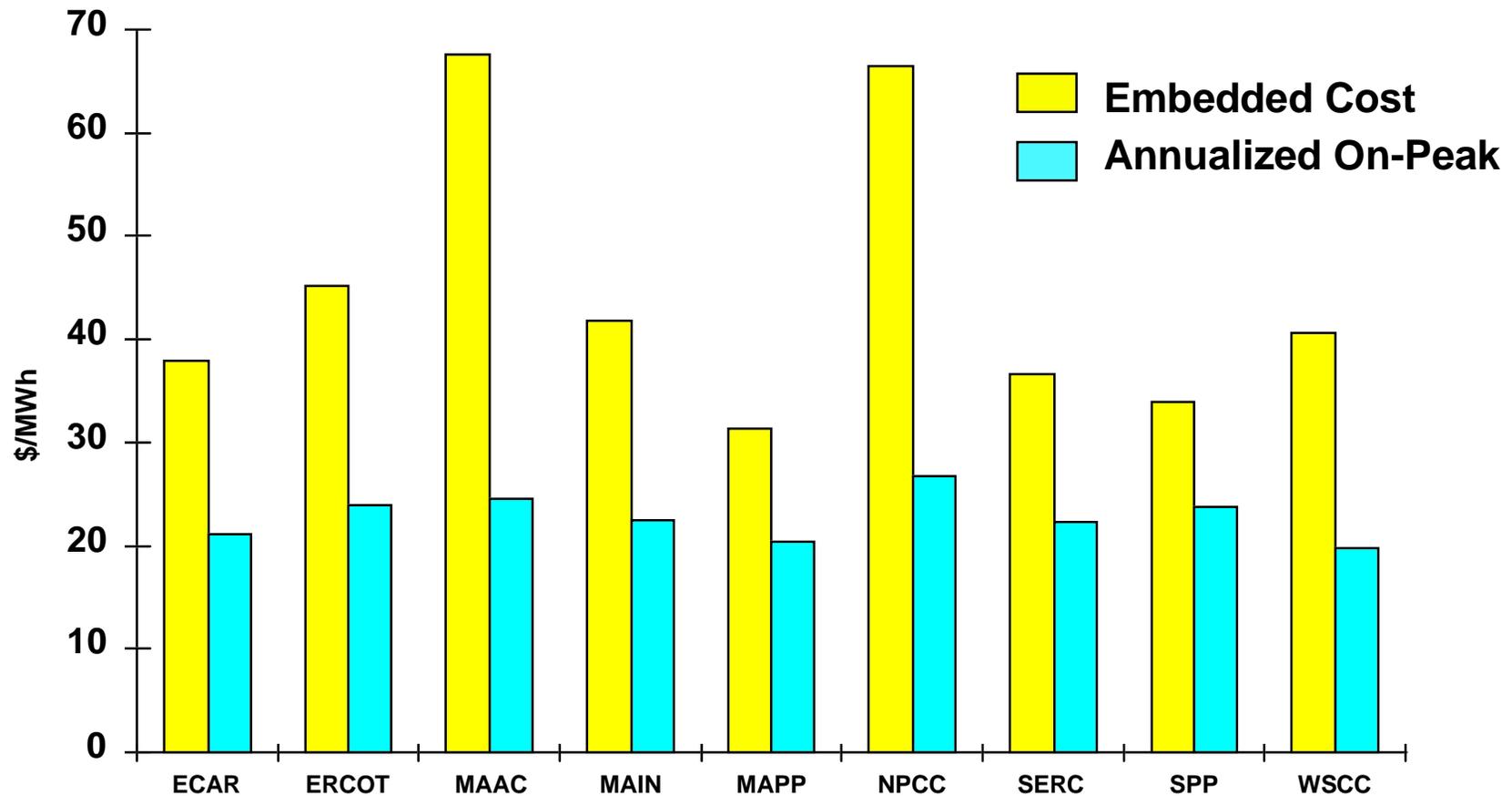
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# U.S. Coal Production Trends

## East & West of Mississippi



# The Price Difference Between Full Capital Recovery and Spot Sales



Source: Power Markets Week

DJS90807



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# Results of Previous Asset Sales

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<u>Asset</u>	<u>Price/kW</u>	<u>Implied ROR Based on Forward Costs</u>
Cajun	\$641	6.0 %
NEES	\$500	1.1 %

# Why Risk Management?

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## Regulation

Lack of  
Information



Regulation  
& Controls



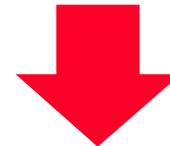
Protection  
of Consumers  
and Producers

## Risk Management

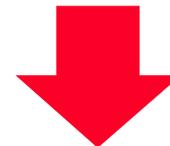
Information  
Technology



Deregulation

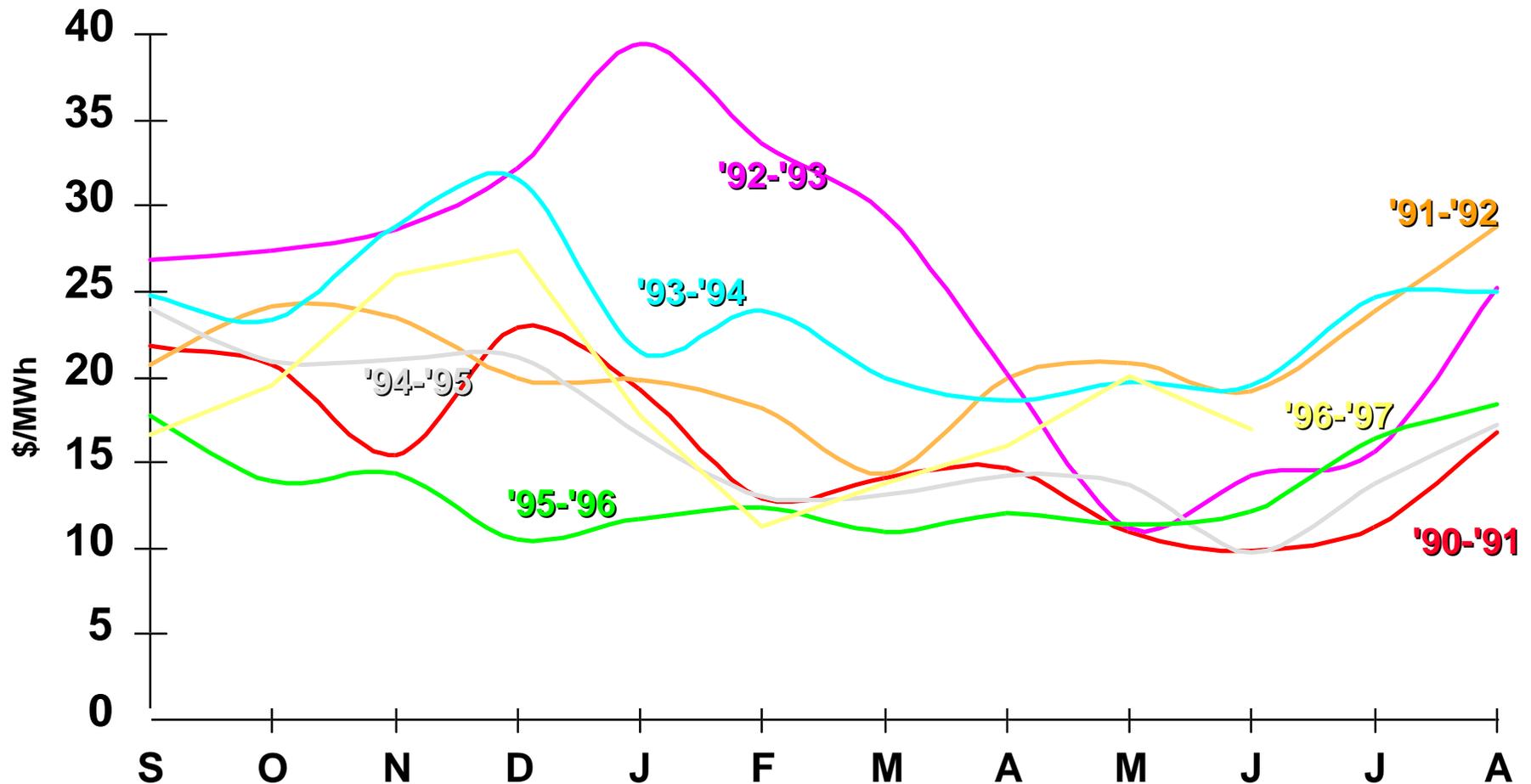


Commoditization

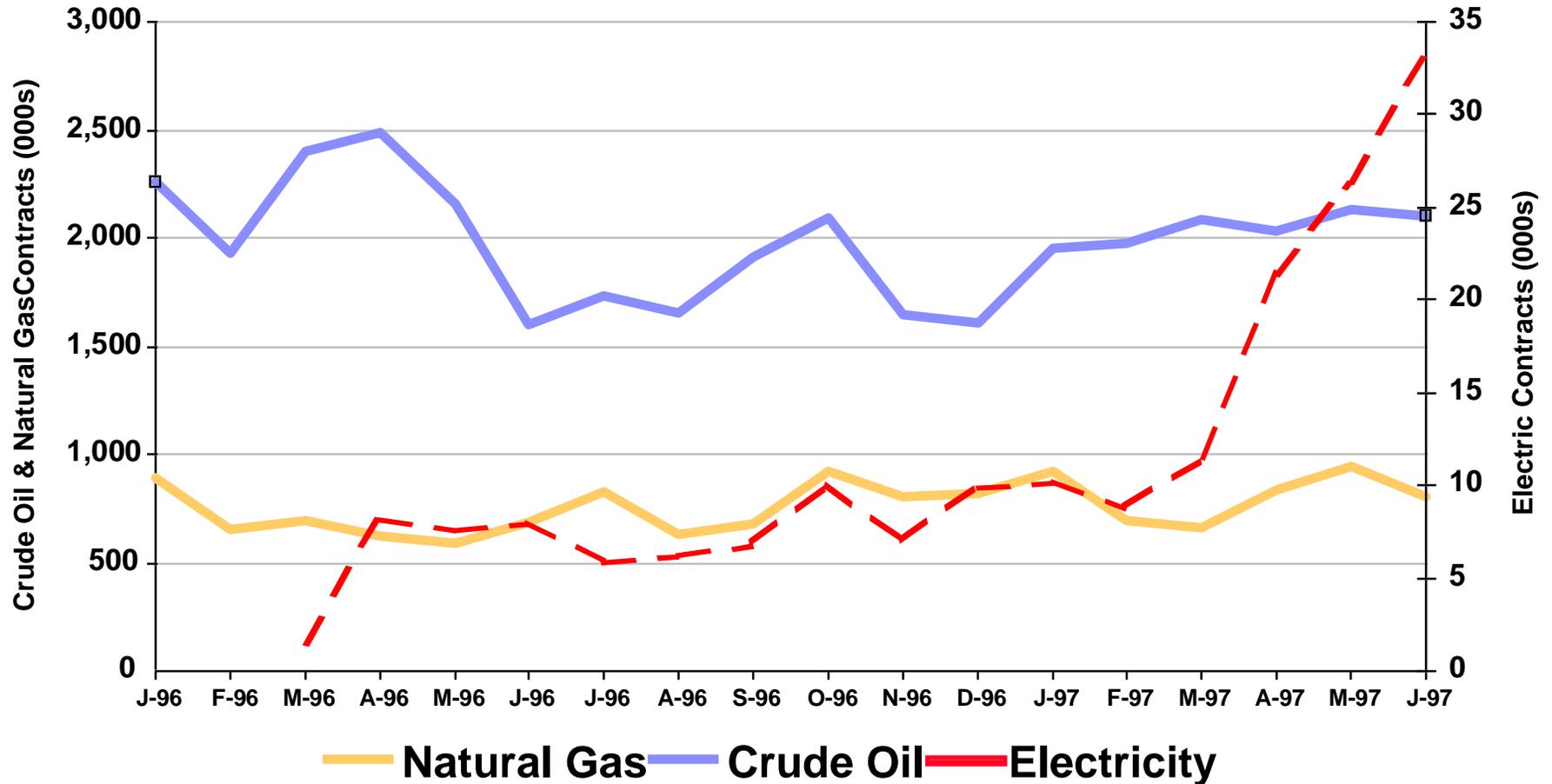


Derivatization  
& Convergence

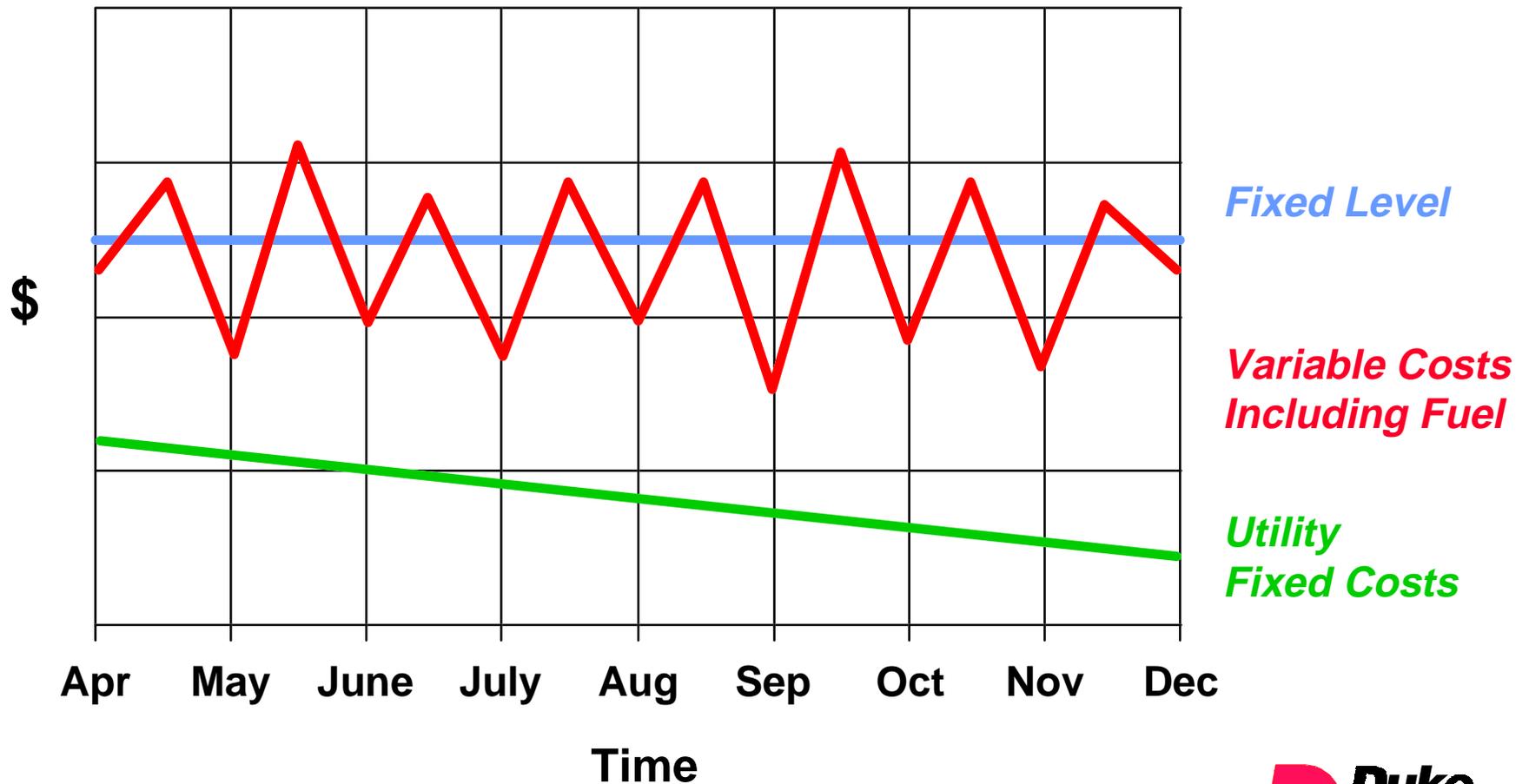
# Northwest Power Pricing History



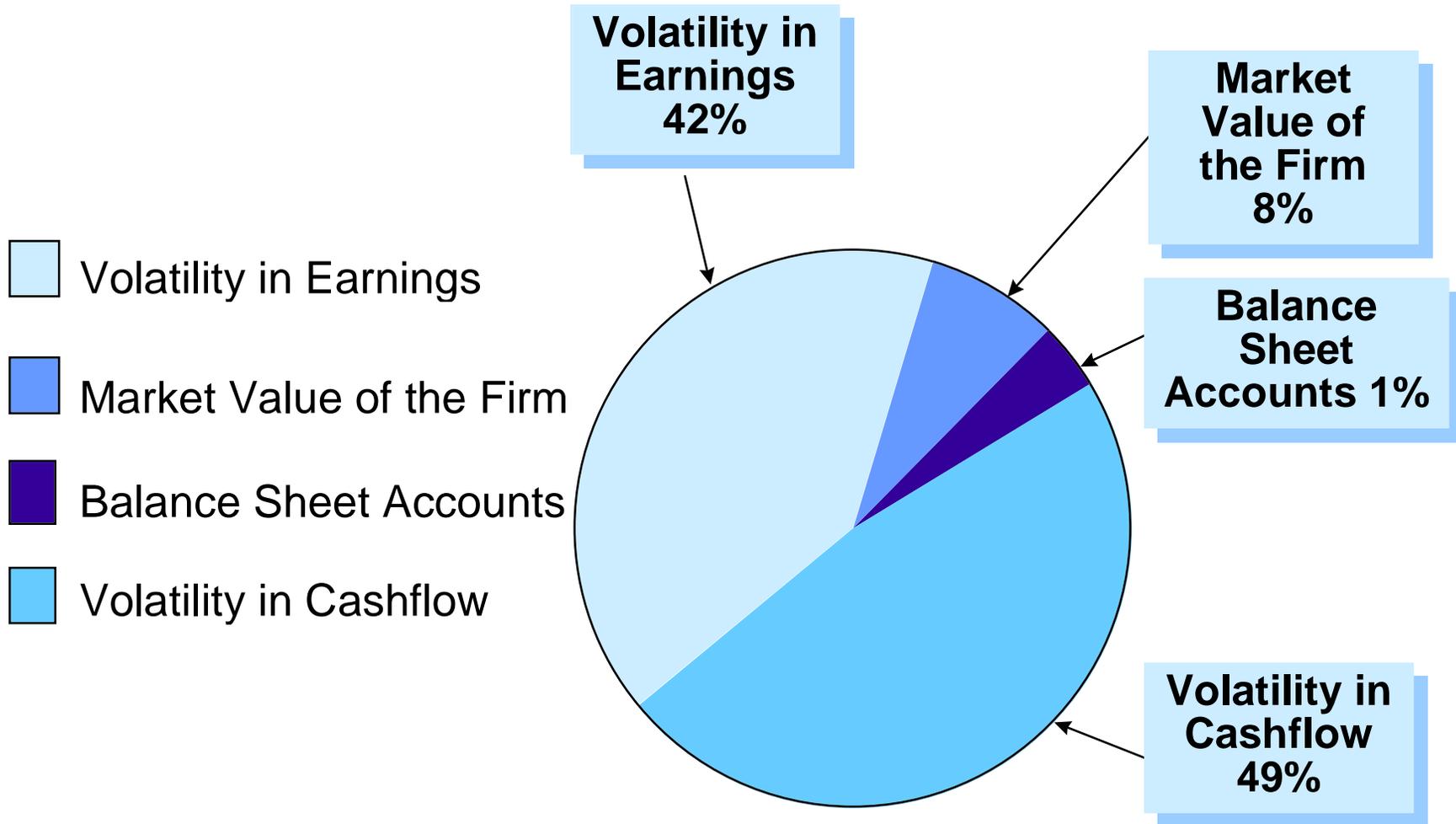
# ***NYMEX Monthly Energy-Related Futures Contract Volumes***



# *Inability to Adjust Rates Militates for Use of Derivatives*



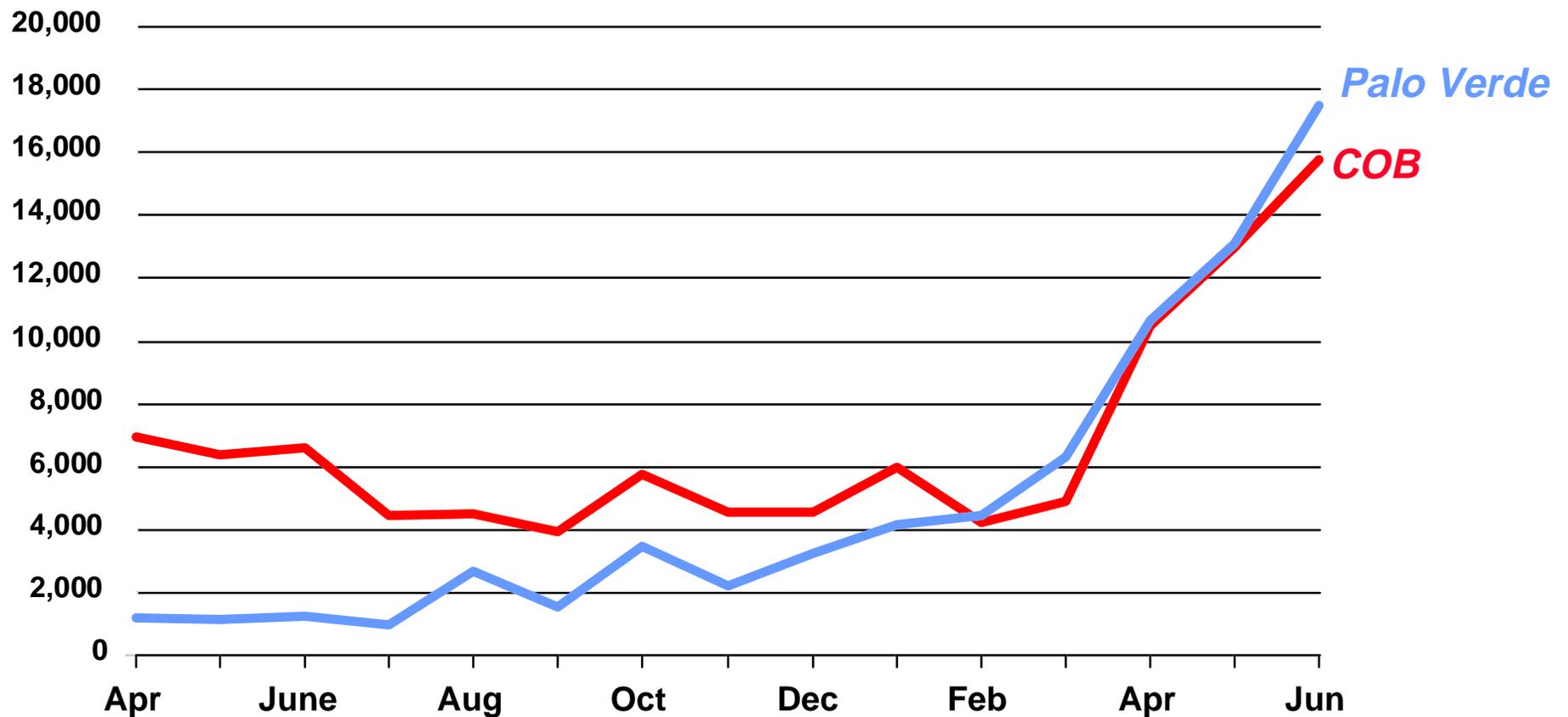
# Most Important Objective for Firms Using Derivatives to Hedge





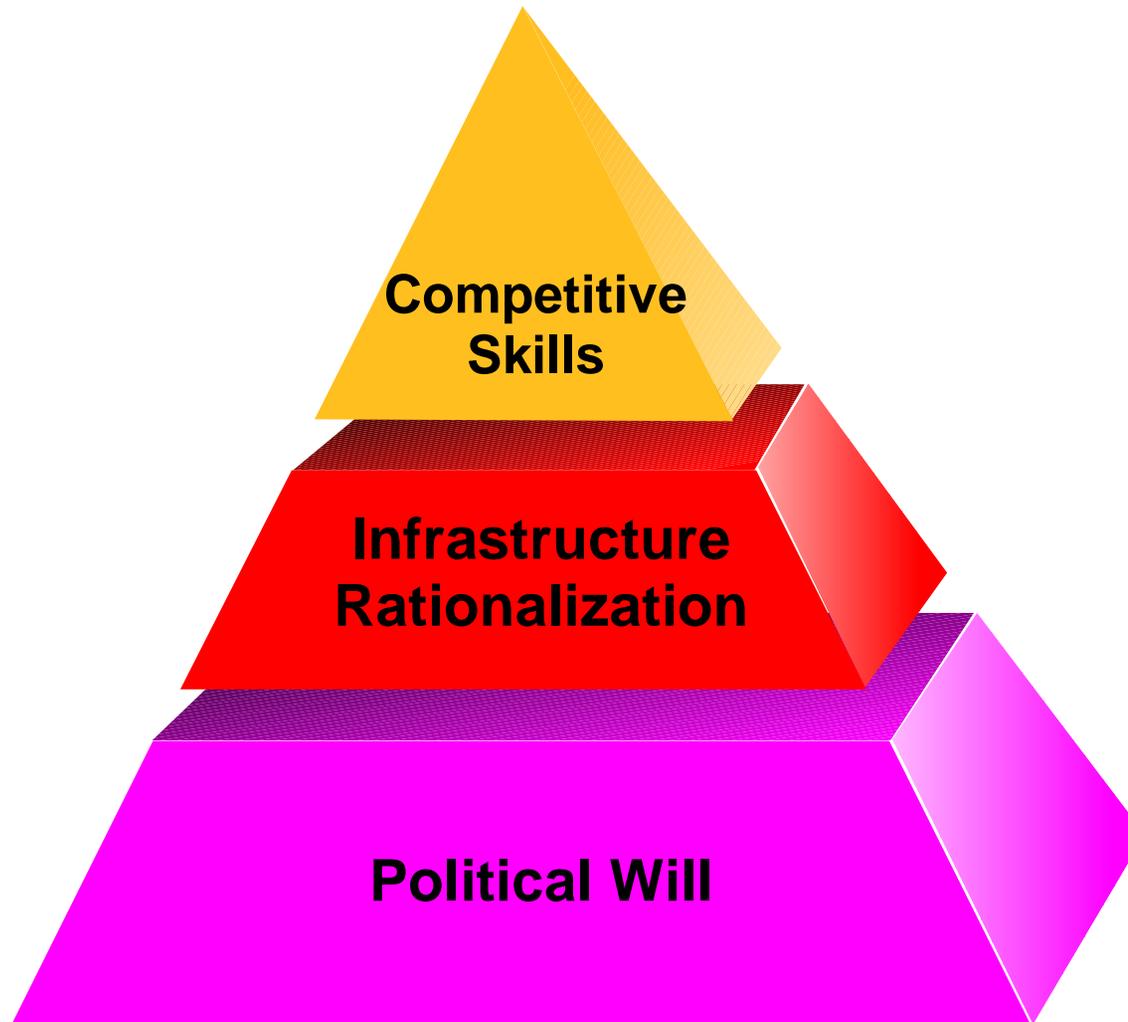
# Electricity Contracts Under-perform on a Volume Basis

Number of Futures Contracts Traded April '96 - June '97

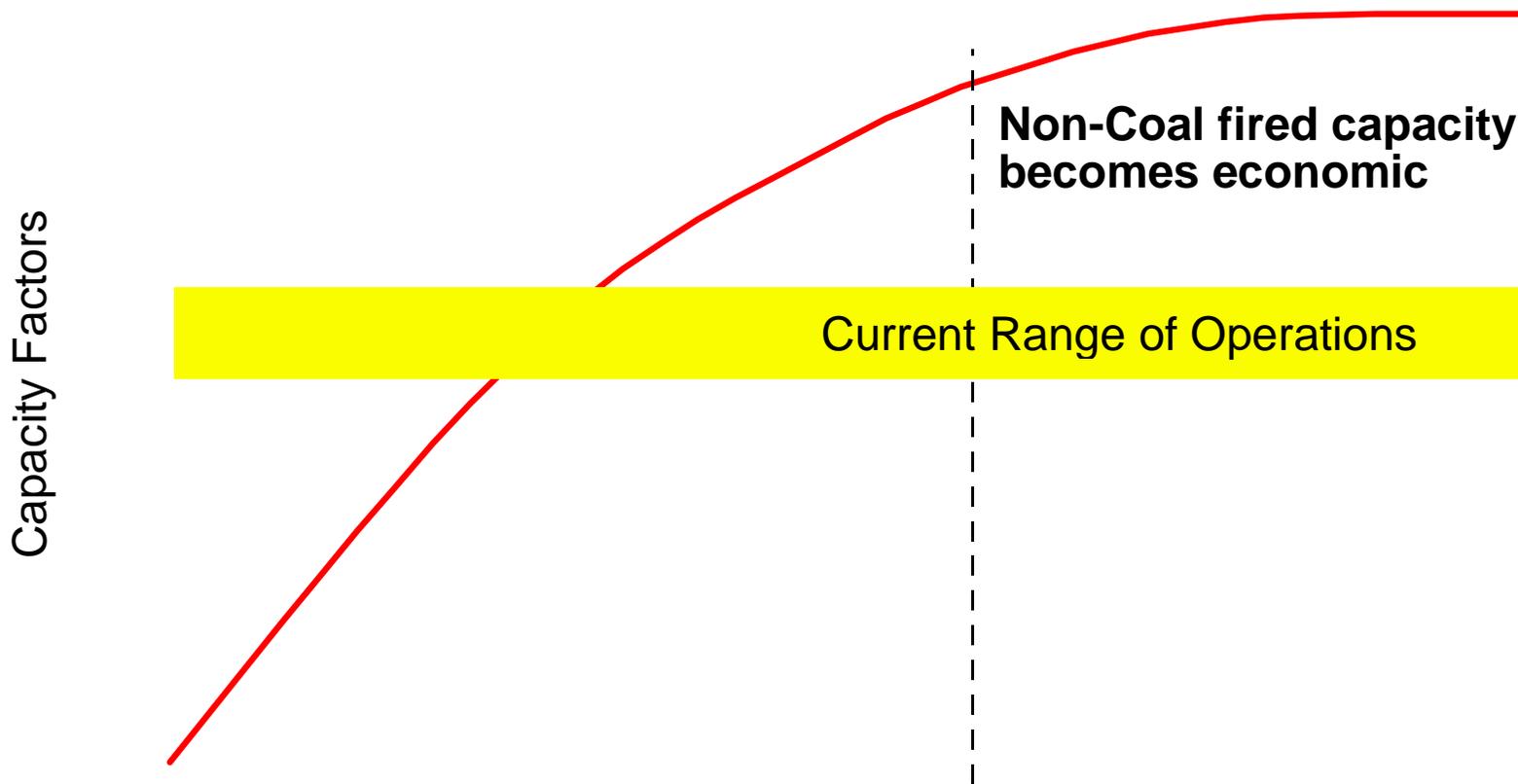


# *Elements Necessary for an Open Market in Electric Power*

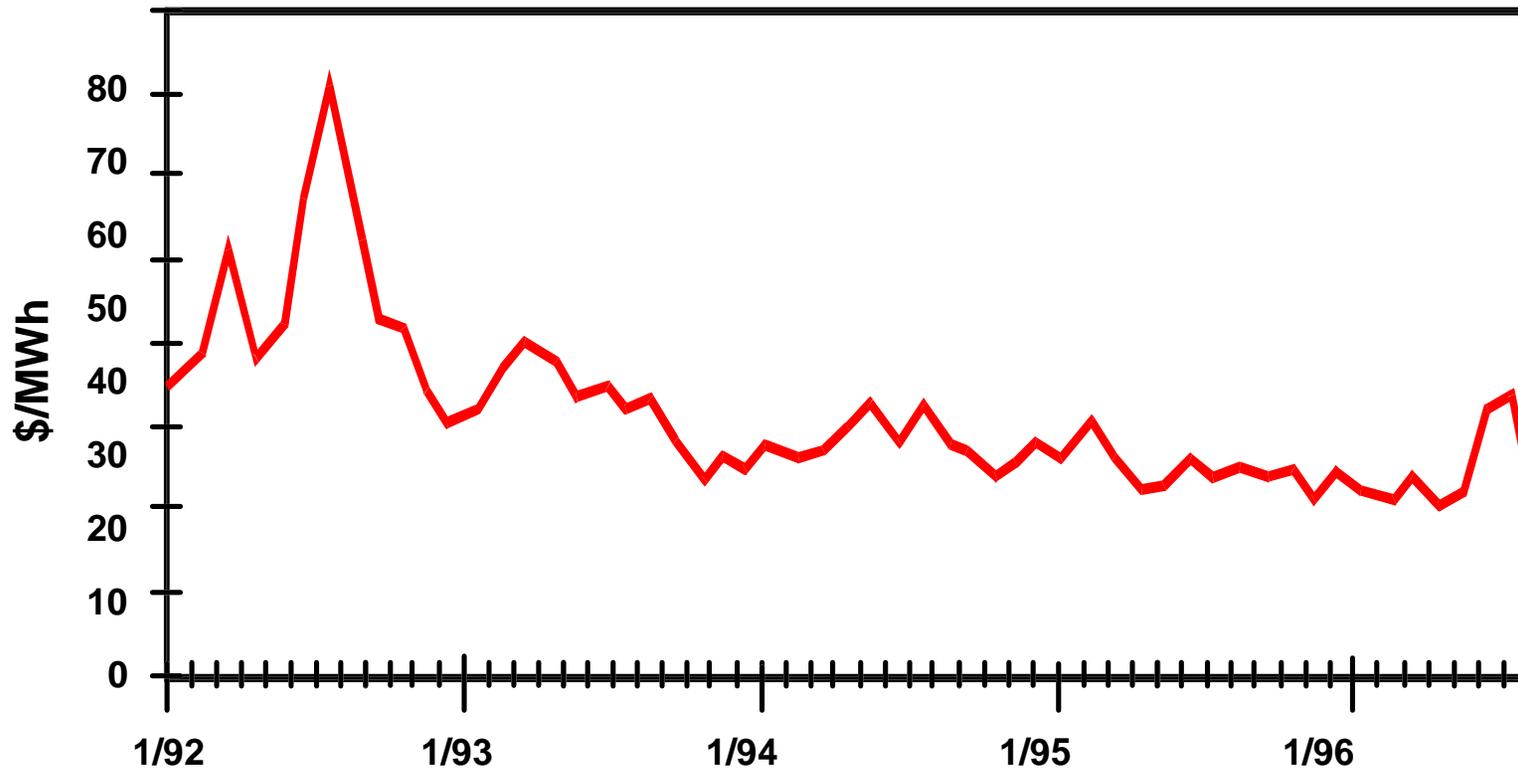
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# Midwest Coal Generation Curve Capacity Factor vs. Heat Rates



# *Don't Cry for Me, Argentina*



Spot Market Power Prices in Argentina Upon Deregulation

# ***Challenges for Public Power Under Deregulation***

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- Increasing complexity and national scope of business
- Devaluation of asset base and concomitant deterioration of credit quality
- Limitations on structuring flexibility (e.g., private use rules)