

Economic Impact of Electricity Restructuring in Oklahoma: Phase II Analysis

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to the

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Purpose of Study

- **What are the price and economic impacts of restructuring the OK electric sector**
 - Phase I looked at near-term with existing facilities
 - Phase II looks further out (2010), includes customer response and broader economic analysis
- **Focus on just the state as whole, not individual utilities or surrounding regions**

Methodology

- **Extrapolate Phase I Results from ORCED**
 - Escalate 1999 demands and fuel prices to 2010
 - Determine transmission limits on exports
 - Add proposed capacity to electric supply
- **Modify demands, supplies, and pricing as discussed below**
- **Conduct a separate analysis of broader Oklahoma economy**

Five Key Results

- **Announced capacity additions are more than market can absorb.**
- **Large amount of new capacity could cause lower prices but facilities would be unprofitable.**
- **Existing coal and hydro plants are highly profitable (and customer prices are higher) unless their prices are cost-based.**
- **Customer response to real-time prices can lower peak demands about 9% and reduce peak prices.**
- **Broader impact on economy of higher prices is modest.**

Expected fuel prices in 2010 from EIA Annual Energy Outlook 2001

	1999 Avg. Fuel Cost, \$/MBtu	Annual Escalation Above General Inflation	2010 Avg. Fuel Cost, 1999\$/MBtu
Gas	2.73	1.8%	3.34
Coal	0.94	-1.0%	0.84
Dist. Oil	2.06	1.0%	2.29

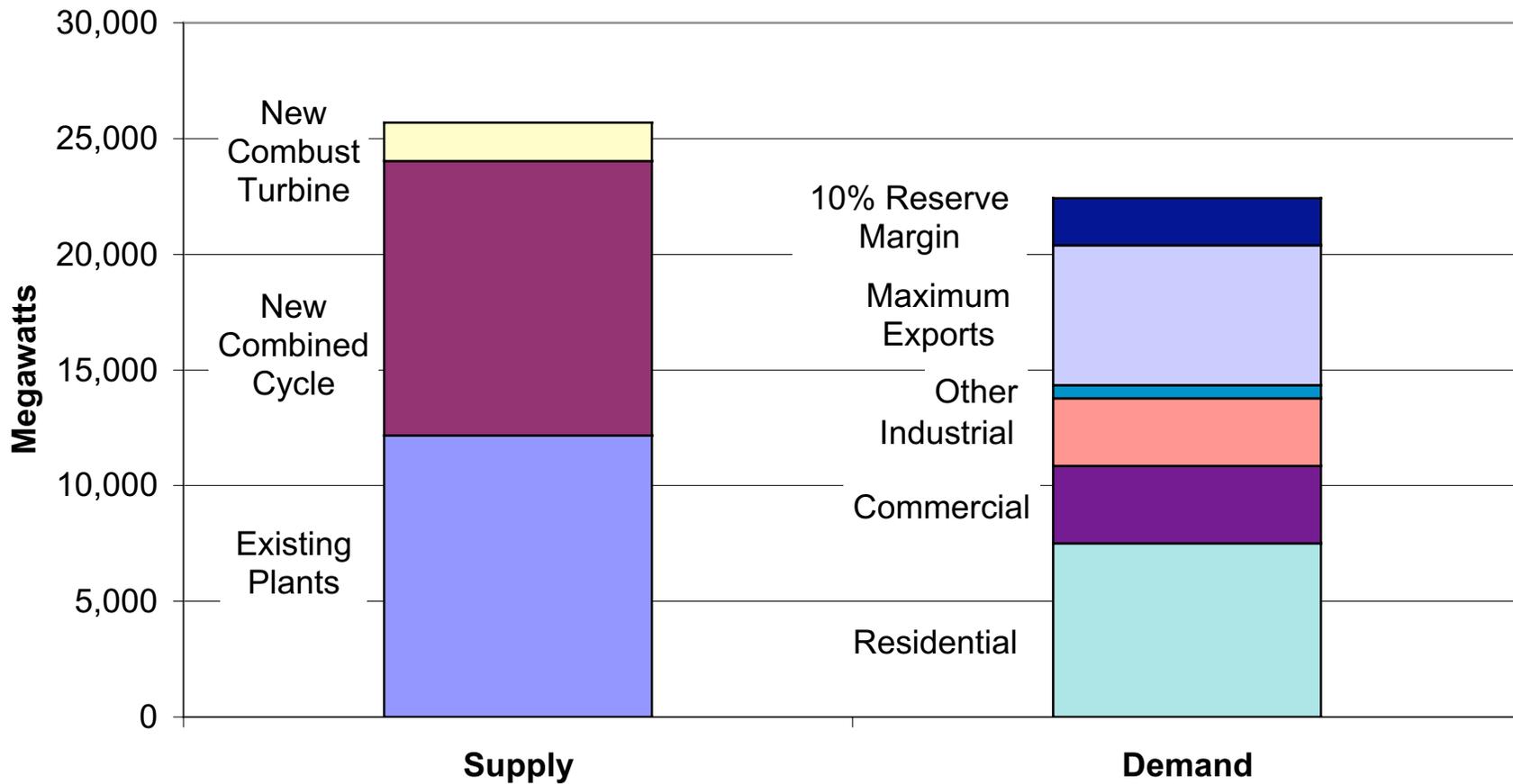
Potential Demand in 2010

- **1999 OK internal peak demand 11,300 MW**
- **Assume 26% growth by 2010 to 14,350 MW**
 - Vary growth by sector based on EIA data
- **Expand exports from current ~800 MW to 6,030 MW**
 - Eight 345 kV lines, 15 smaller lines to other states
 - Fully load transmission lines
- **Total peak demand of 20,380 MW**

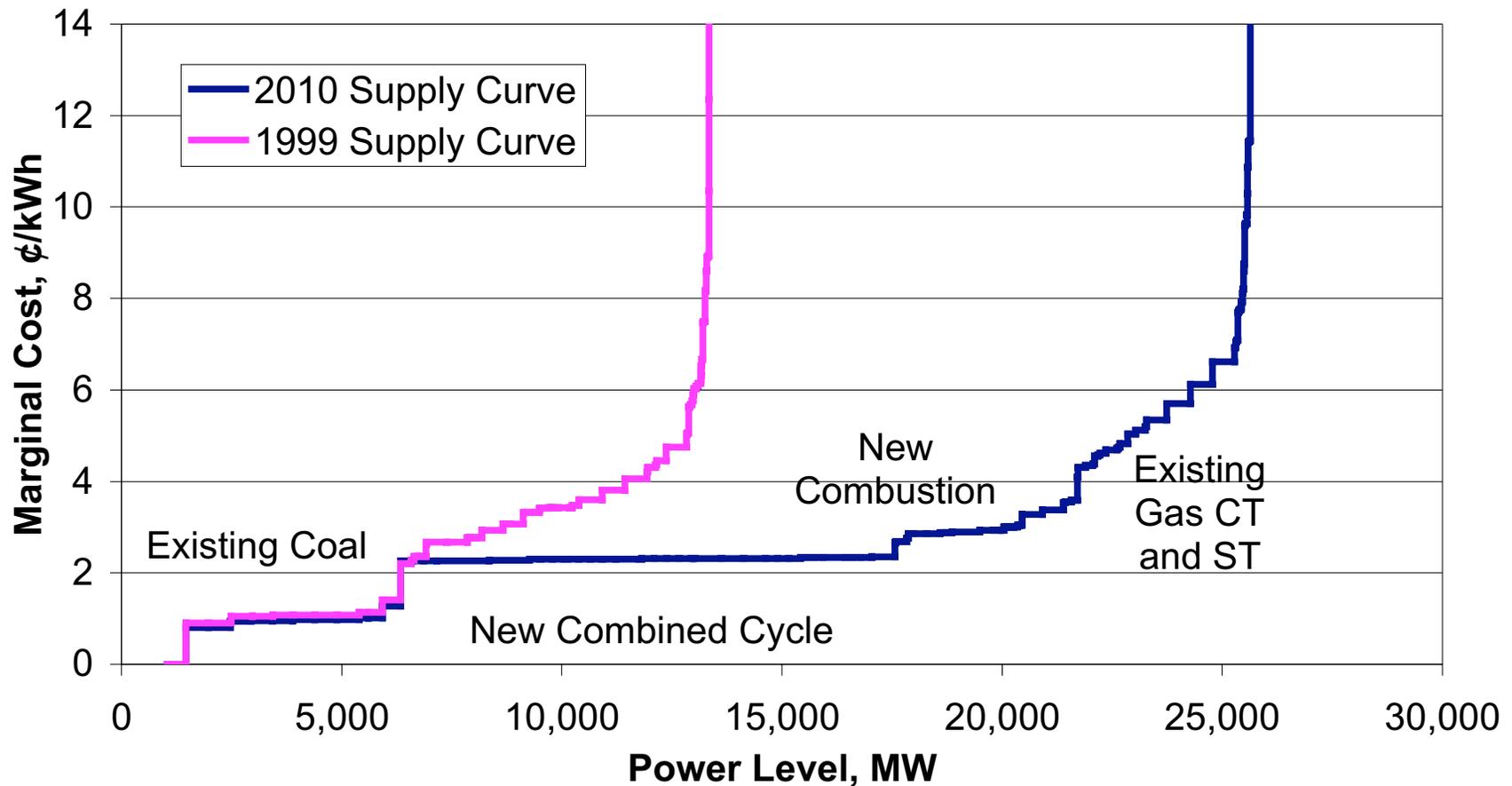
Planned Capacity Higher than Demand

- **Current capacity of 13,300 MW**
- **Announced new capacity of 13,500 MW**
- **Net after retirements of 25,700 MW**
- **Reserve margin of 26%**
 - Even higher in earlier years
- **For our analysis, we lowered capacity by 3,500 MW to reduce reserve margin**

New Combined Cycle plants dominate supply



Supply curve expansion by 2010



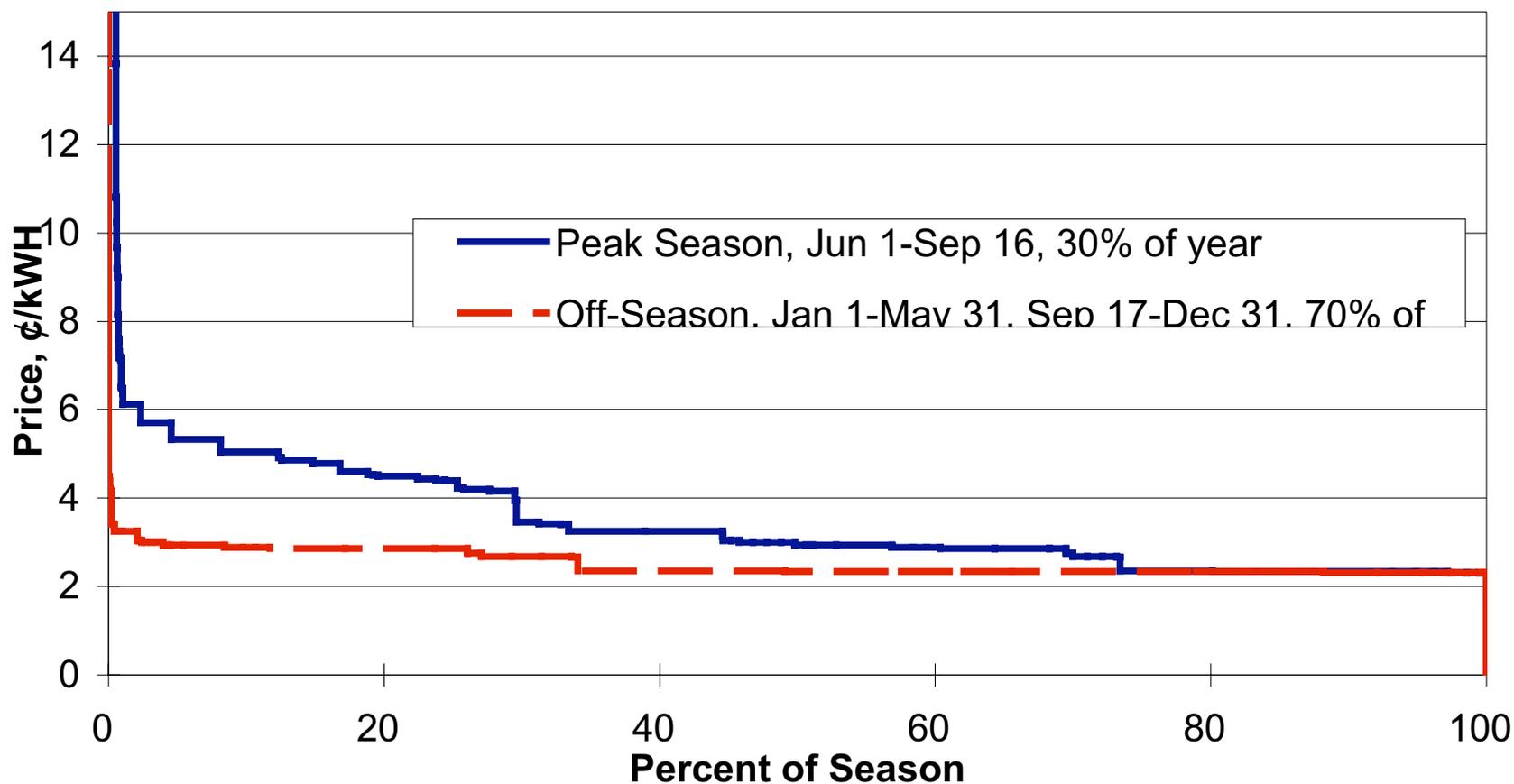
New plants have low profitability if price based on spot market

- **Combined Cycle plants are on margin 64% of time.**
- **If price is based solely on marginal costs then:**
 - **Combined Cycle total cost is ~3.6¢/kWh**
 - **Low prices during much of year, ~2.3¢/kWh**
 - **Plants cannot recover fixed costs during that time**
 - **Prices are not high enough during rest of year to recoup all fixed costs and returns on investment**
- **Average prices to residential customers are 0.6¢/kWh lower than regulated prices**

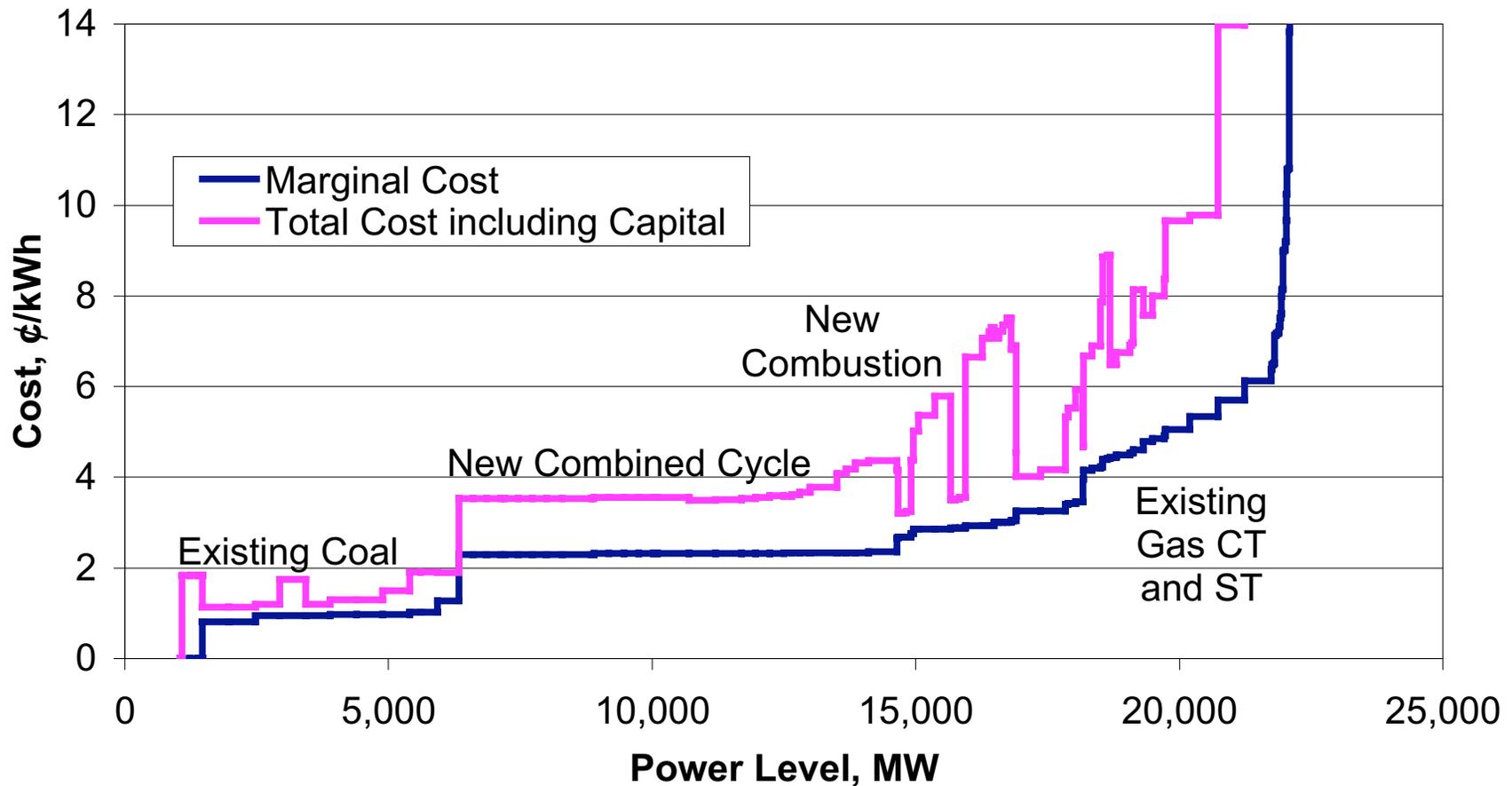
Plant pricing will depend on variety of factors

- **Spot pricing reflects marginal costs of production**
- **Long-term pricing may reflect total costs including capital and returns**
- **If plants receive prices based on total costs then result is similar to regulated pricing**
- **Hedging, ancillary services, market factors make actual pricing more complex**

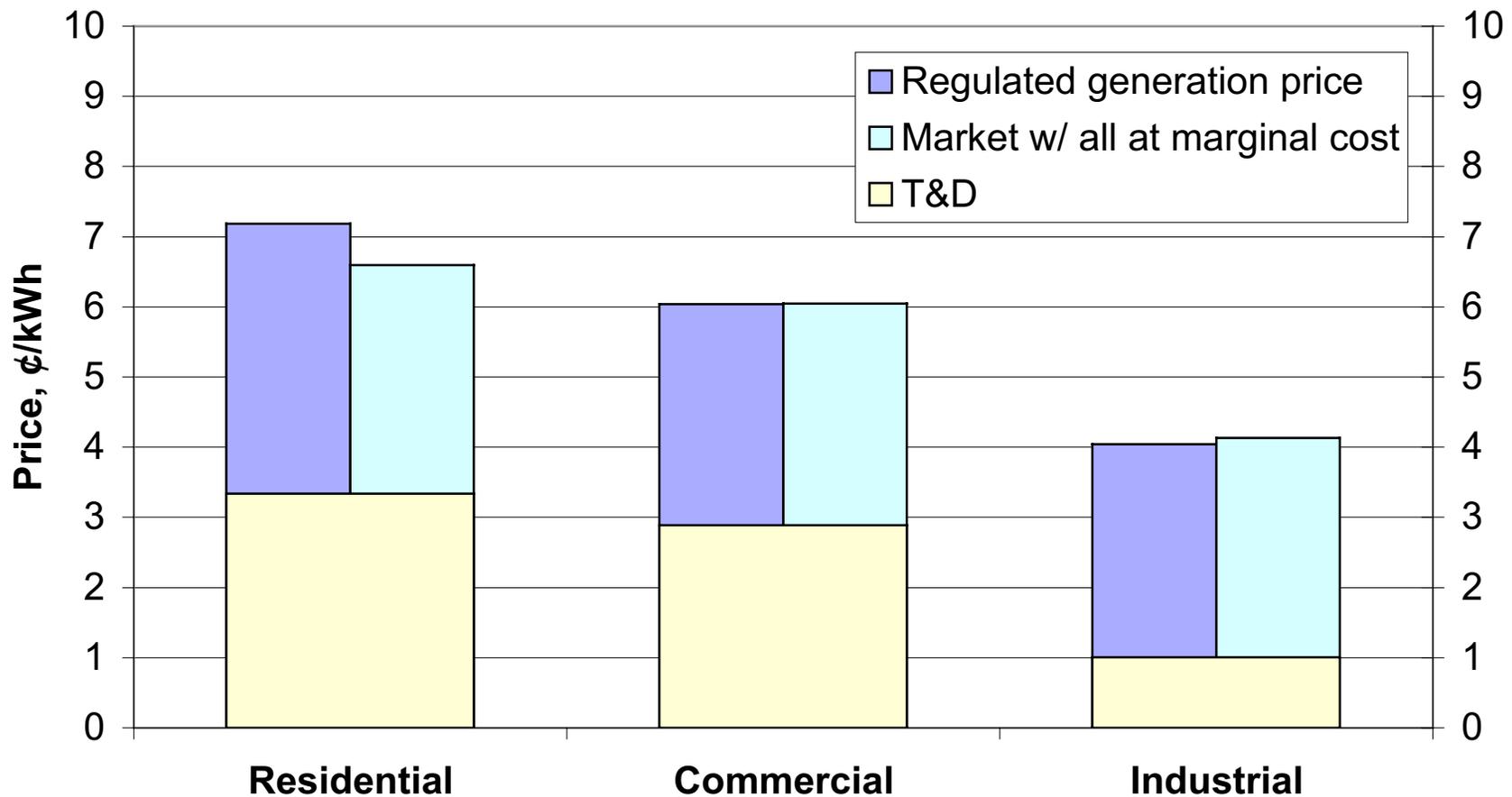
Prices below 3.6¢/kWh all but 30% of peak season



Supply curve with variable and total cost



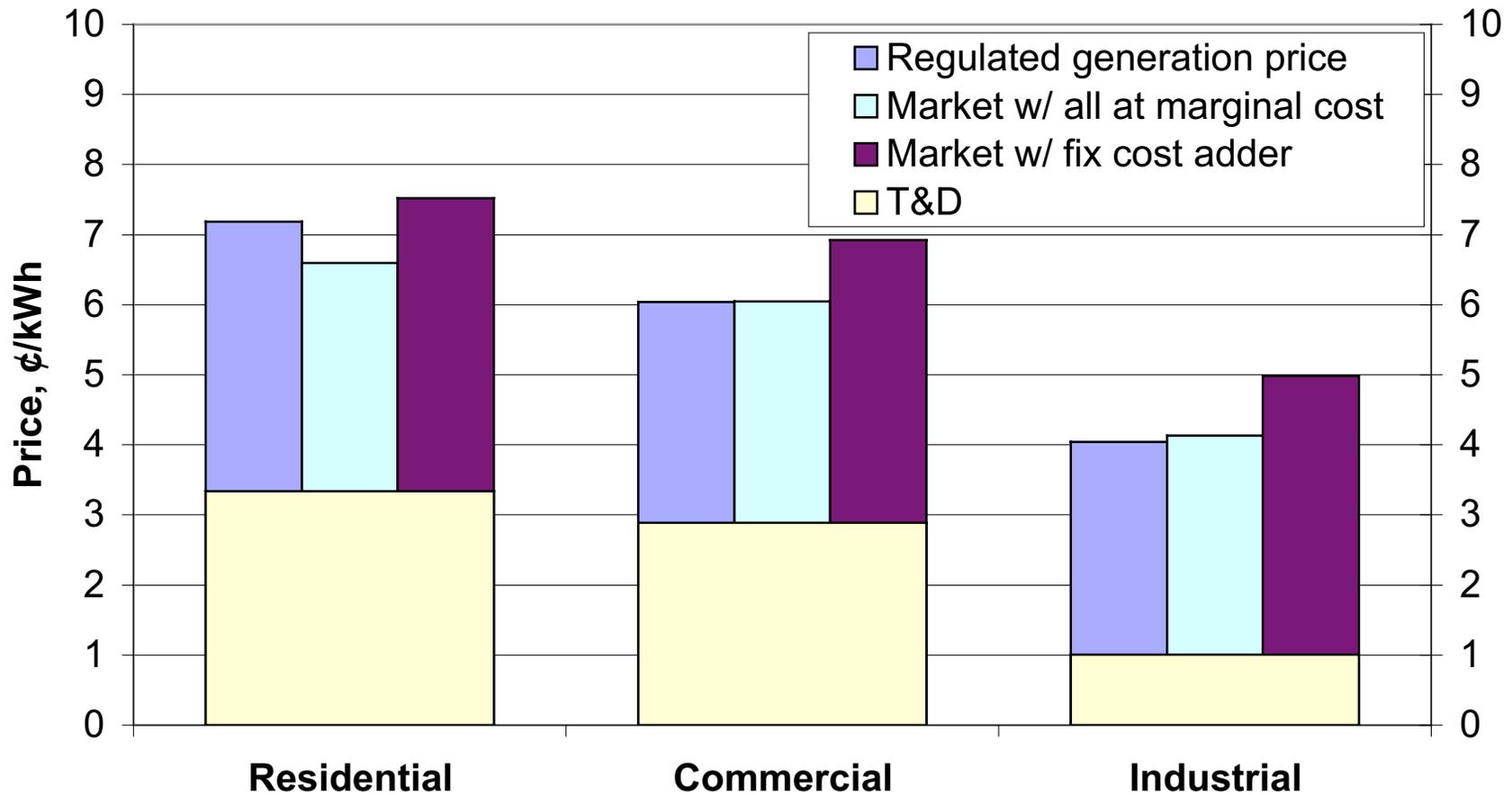
Consumer prices are lower or equal if all plants price on their margin



Low-cost plants profit greatly

- **Coal and hydro plants have low total cost**
 - Capital cost largely depreciated
 - Low fuel costs
- **Assume all plants raise prices to make their expected rates of return**
- **Coal and hydro plants make high returns because they receive same price as others**
- **Customer prices rise by average of 15%**

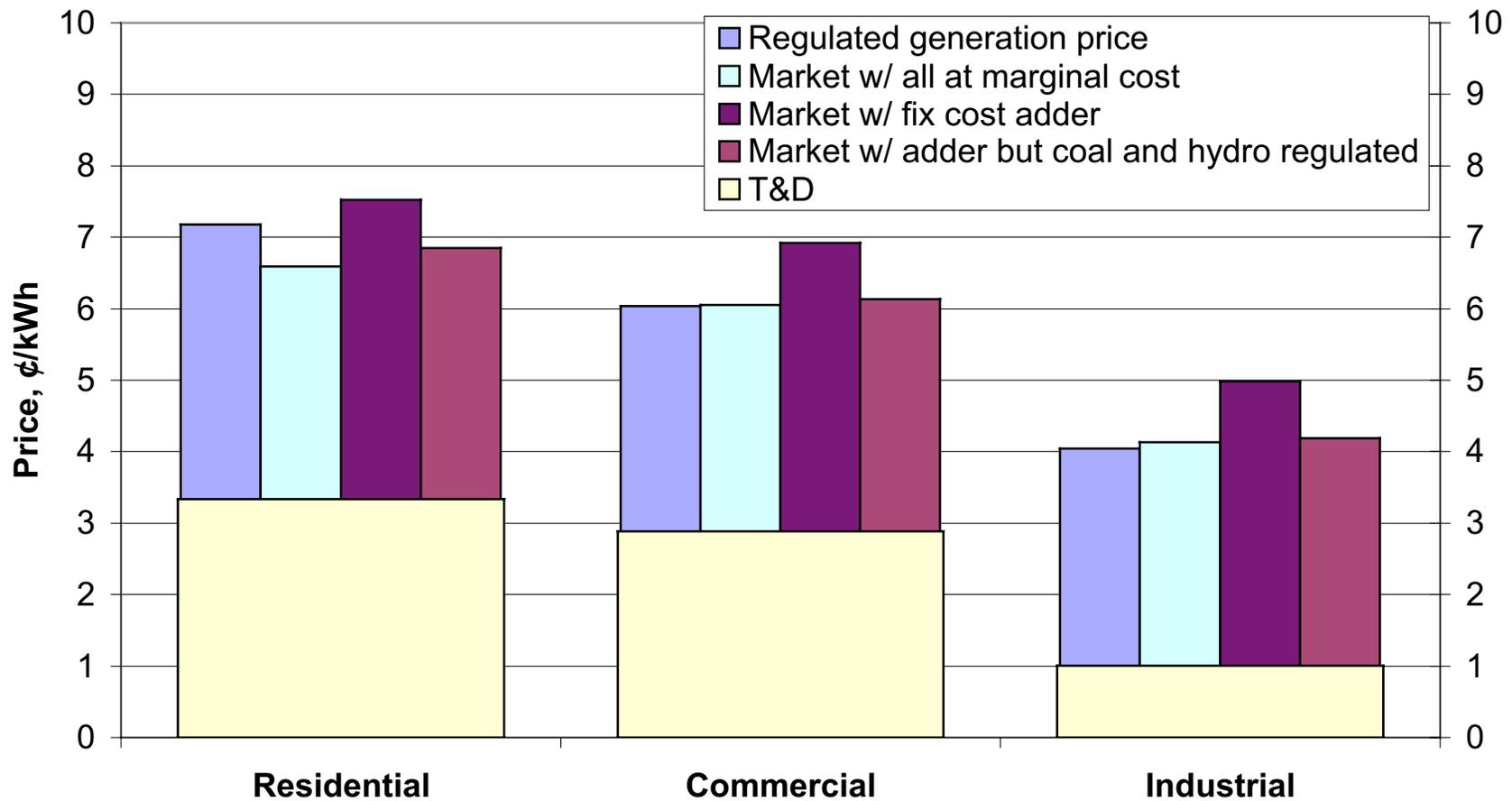
Customer prices with plants adding fixed costs to bids



Separate, cost-based pricing for low-cost plants

- **If low-cost plants (hydro, coal) sell at cost plus reasonable return**
 - Average prices for consumers are lower
 - New plants are unaffected
 - Old plants still make adequate return
- **Prices could be set through:**
 - Long-term contracts when deregulated, or
 - Continued regulation of some plants
- **Other states have followed these steps**

Customer prices with coal and hydro plants at cost-based rates



Market power sensitivities

- **Base case has simple market power**
 - All plants include 25% of fixed cost in each bid
 - Assumes other suppliers don't undercut
- **Technology-specific market power studied**
 - New CC plants raise bids to just below next technology
 - Minor impact
- **Single owner withhold power**
 - Adds net revenue if price increases
 - Amplified if withheld plant has cost-based rates
 - Will not work if broader market has alternative sources

Customer response to prices

- **With real-time prices, customers cut back during peak prices, increase at low prices**
- **Using an elasticity of -0.1, peak demand drops 9%**
- **Less capacity is needed, but remaining capacity operates more**
 - **Less need for higher prices**
 - **Peak prices decline**

Broader economic impact analyzed through input/output model

- **Increases in prices have modest impacts**
 - <0.5% change in output except those directly connected to electricity production
- **Some industrial sectors decrease output**
 - Metal mining -0.4% – Plastics, resins -0.3%
 - Agriculture -0.4% – Paperboard -0.2%
- **Electricity-related industries see increase**
 - Coal mining 1.7% – Railroads 0.4%
 - Electric utilities 10% – Steam turbines 1.2%

Conclusions

- **Expect cancellations of some plants as market enters possible glut of capacity.**
- **Glut can lower prices to customers but solvency of plants are then affected.**
- **Existing low-cost plants should do well, but could raise average prices unless treated specially during restructuring.**
- **Reports can be found on our website at <http://www.ornl.gov/psr>**