

CHP & Policies for Promoting Gas Efficiency

United States Environmental Protection Agency

Workshop on Gas Efficiency

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CHP Context: Policies & Regulatory Objectives

- Emissions reductions
- Reduced grid congestion
- Reliability, diversity
- Reduced land impacts
- Reduced line losses
- Natural gas savings
- Economic Development
- Wholesale electric price mitigation



Typical Characteristics of CHP

- High efficiency combustion
- Generation at loads
- Dispersed generation
- Reduced use of transmission and distribution
- Reduced market demand for power



But, not all CHP is the same...

- Fuel choices can impact emissions
- Emissions are “local” and may continue or cause non-attainment
- Where gas is fuel:
 - Prices affected by gas-fired electric generation demand
 - Summer use for electricity generation can impact ability to store gas for winter



CHP: Part of Wider Array of Demand-side Resources

- Demand Response
 - Load management
 - Long-term end-use energy efficiency
 - Consumer response to prices
- Demand-side Resources can produce value at all points in the electric and gas system
- What's good for demand response generally is also usually good for CHP

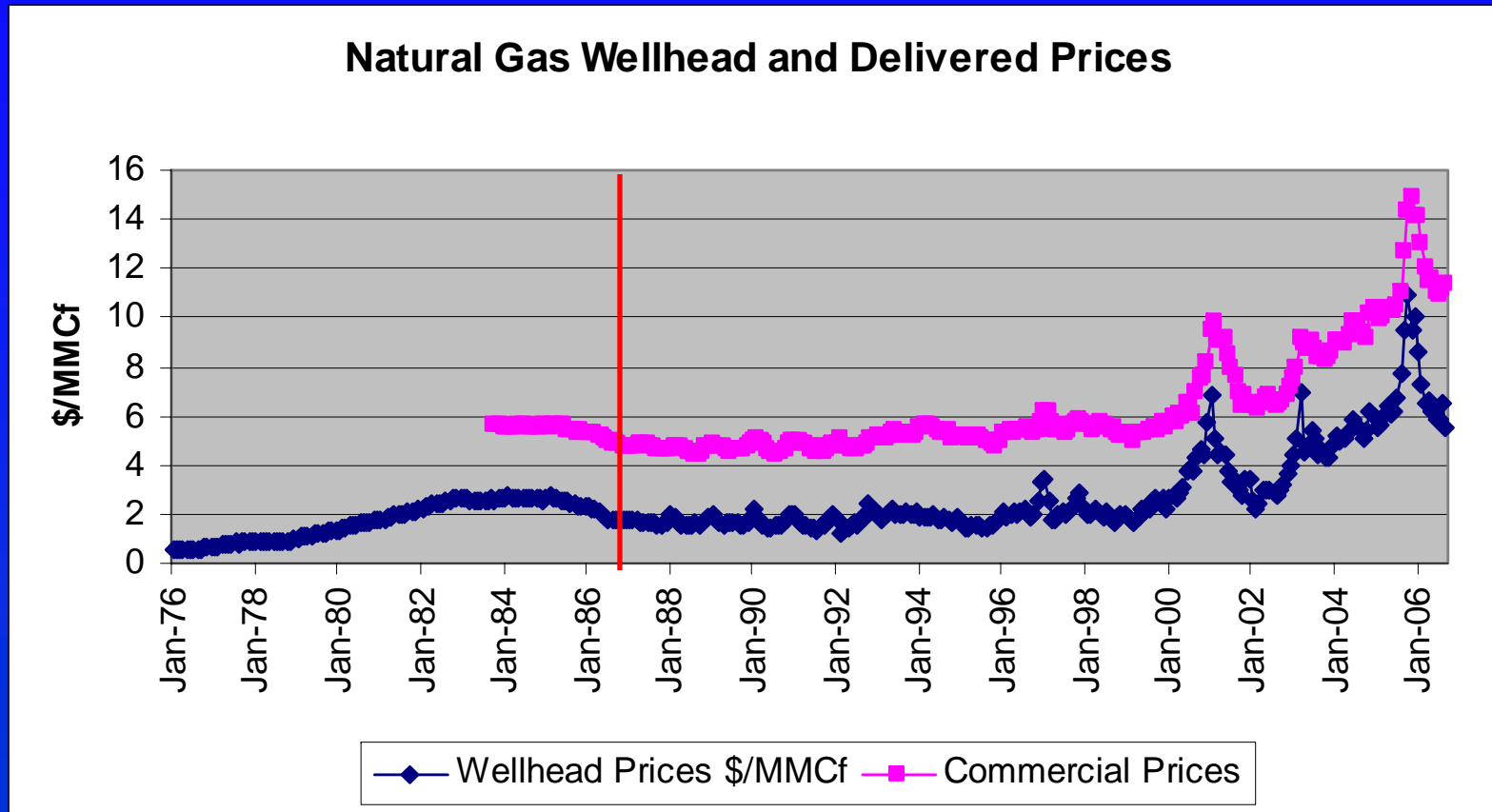


Major Barriers to CHP and Demand-side Resources

- Interconnection of generating equipment
- Utility profit issues (more on this later in the day)
- Pricing and Rate Design
 - Effects of “average pricing”
 - Competing policy objectives of regulators with respect to price levels and rates of change
- Utility and Regulatory cultural inertia



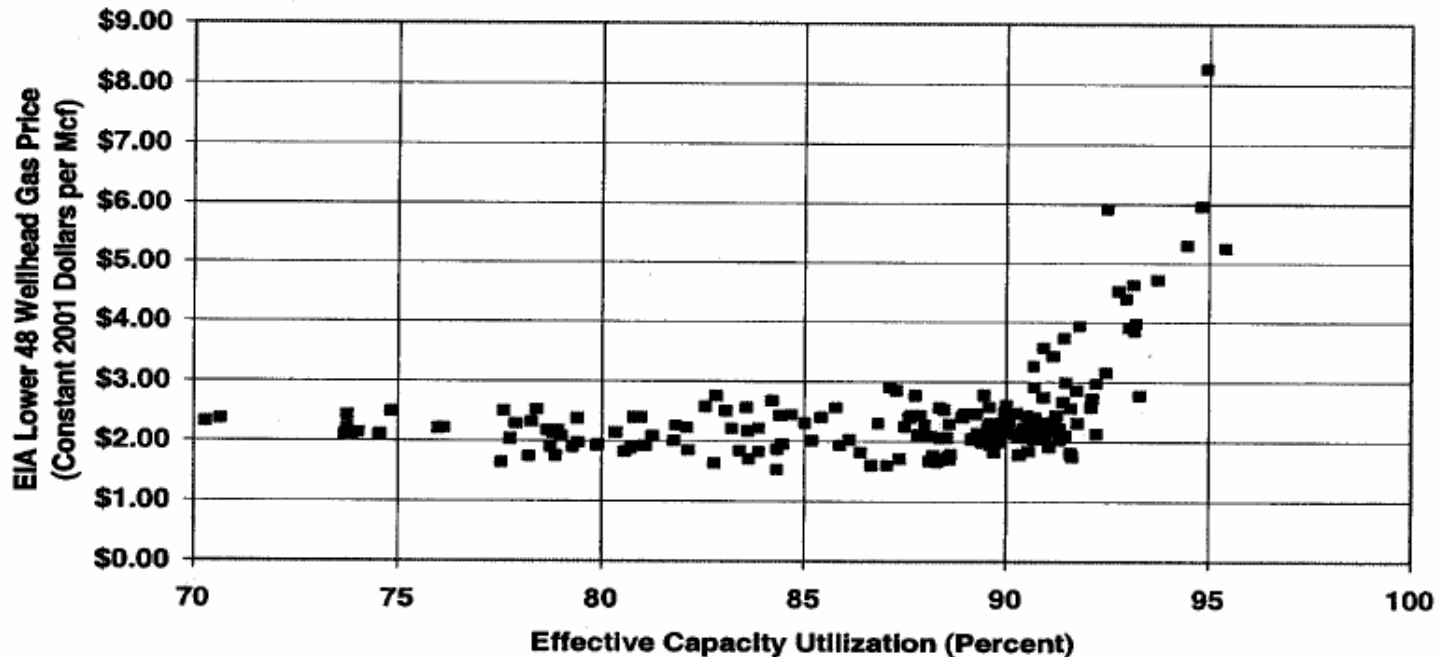
Crossing a Line: 1987 Repeal of the Fuel Use Act





Prices Also Correlate Strongly to Capacity Utilization

Figure 1. Lower-48 States Effective Capacity Utilization and Gas Prices, 1987-2001



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.



Economics of CHP and Demand-side Resources

- Load duration curve of CHP is very important
- Economics are driven by correlation between changes in consumption and the opportunity prices *at those times*
- In constrained markets, on-peak prices can be substantially higher than average prices, and so their avoidance is more valuable



An Array of Competing Objectives

- Easing Natural Gas Prices Generally
- Reducing Volatility in Gas Prices
- Achieving appropriate prices for better consumer decision-making
- Maximizing the useful work derived from a fuel source
- Reducing Emissions
 - Local Issues
 - In aggregate
- Addressing electric system issues (transmission congestion, reliability, power quality, etc.)



Approaches to Gas Efficiency: It Matters Who the Customer Is

➤ Residential:

- Limited waste heat recovery opportunities
- Existing housing has virtually no fuel switching capability
- New housing presents opportunity for embedding efficiency
- Relatively less price elasticity
- Morning/Evening “peaks” -- coincident with local distribution system, but not necessarily with “system” as a whole (especially pipelines)

➤ Commercial/Industrial:

- May have fuel switching capability
- More likely to have waste heat resources
- Relatively more price elasticity
- Higher relative load factor & system coincident peaks



Gas Efficiency Bang for Buck Is Sometimes On Electric Side

- Two-fold impact
 - Relative inefficiency of gas-fired electricity
 - Peak correlations and inter-seasonal impacts of gas-fired electricity on gas pricing and pipeline capacity utilization
- “Total” efficiency of gas versus gas-fired electricity...



Gas As An Electric Fuel: Not All Energy Is the Same

Energy Type	Extraction	Processing	Transportation	Conversion	Distribution	Cumulative Efficiency	Source Energy Conversion Factor
Natural Gas	96.8%	97.6%	97.3%	100.0%	98.4%	90.5%	1.1
Oil	96.8%	90.2%	98.4%	100.0%	99.8%	85.7%	1.2
Electricity							
Coal-Based	99.4%	90.0%	97.5%	33.4%	92.0%	26.8%	3.7
Oil-Based	96.8%	90.2%	98.4%	32.5%	92.0%	25.7%	3.9
Natural Gas-Based	96.8%	97.6%	97.3%	31.8%	92.0%	26.9%	3.7

Source: AGA report EA 1990-05, "A comparison of Carbon Dioxide Emissions Attributable to New Natural Gas and All-Electric Homes." American Gas Association, October 31, 1990.



Supportive Policies For CHP and Efficiency

- Relationship to renewable resources and the RPS concept
- Tradable environmental attributes
- Participation as an equal resource with supply-side resources:
 - Capacity planning
 - IRP
 - Portfolio Management
 - Capacity markets
- Curing or mitigating market failures or shortcomings
- Rate Design approaches...



Discounted Transportation Rates: Good, Bad or Ugly?

- PG&E and Comed/Keyspan
 - Deeply discounted delivery prices for CHP
 - Directly reduces payback periods for CHP
- Similar to (but different than) load development/retention rates
- What's good:
 - Sends correct *relative* price signal
 - May actually put some projects in place that would not have survived customer payback criteria
- Of concern:
 - Possible deviation from cost-related pricing
 - Customer cross-subsidy issues
 - Related “exit” fees and stranded cost issues



Perhaps a better mousetrap would do...

- Make discounts more cost-based, but:
 - Methodology is difficult
 - Theories not abundant or require quantifying externalities
- Apply a full fuel cycle efficiency function to delivery prices (higher efficiency = lowers price)
 - Can “tilt” the price slope to favor ever-greater efficiencies
 - End-state efficiency determines point on price curve
- Similar approach for emissions?



Policy Query

- Is burning natural gas for electricity production the highest and best use for our natural gas resource?
 - If not, what are best mechanisms to assure best choices are made by policymakers, utilities and consumers?
- Should fuel use be a focus of public policy?
- Do we need to shift to a “total efficiency” paradigm for:
 - Delivery system pricing?
 - Market structures & pricing?
 - Resource choice & planning?
- Time for the “chooser pays” framework in the gas & electric industry?
 - Can be customer
 - But can (and often is) the utility or even the state (see ME)