

# Energy Efficiency's Role in Getting America Out of Its Energy Straightjacket

---

**R. Neal Elliott, Ph.D., P.E.**  
**Industrial Program Director**

**ACEEE**

**&**

**John A. "Skip" Laitner**  
**Senior Economist for Technology Policy**  
**EPA Office of Atmospheric Programs**

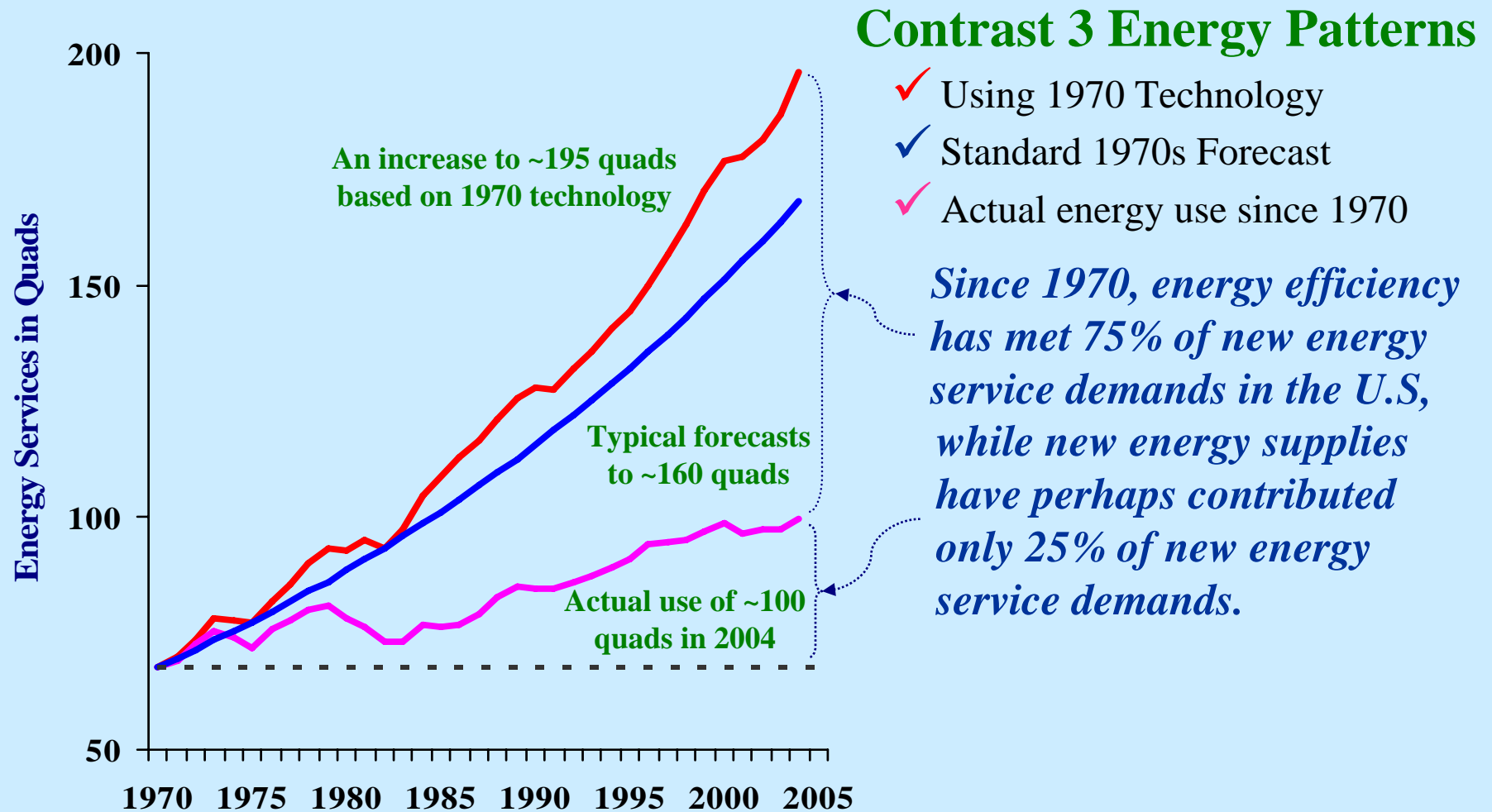


## **An Opening Thought on the Tough Choices**

“Individuals have a natural tendency to choose from an *impoverished option bag*. Cognitive research in problem solving shows that individuals usually generate only about 30 percent of the total number of potential options on simple problems, and that, on average, individuals miss about 70 percent to 80 percent of the potential high-quality alternatives (emphasis in the original).”

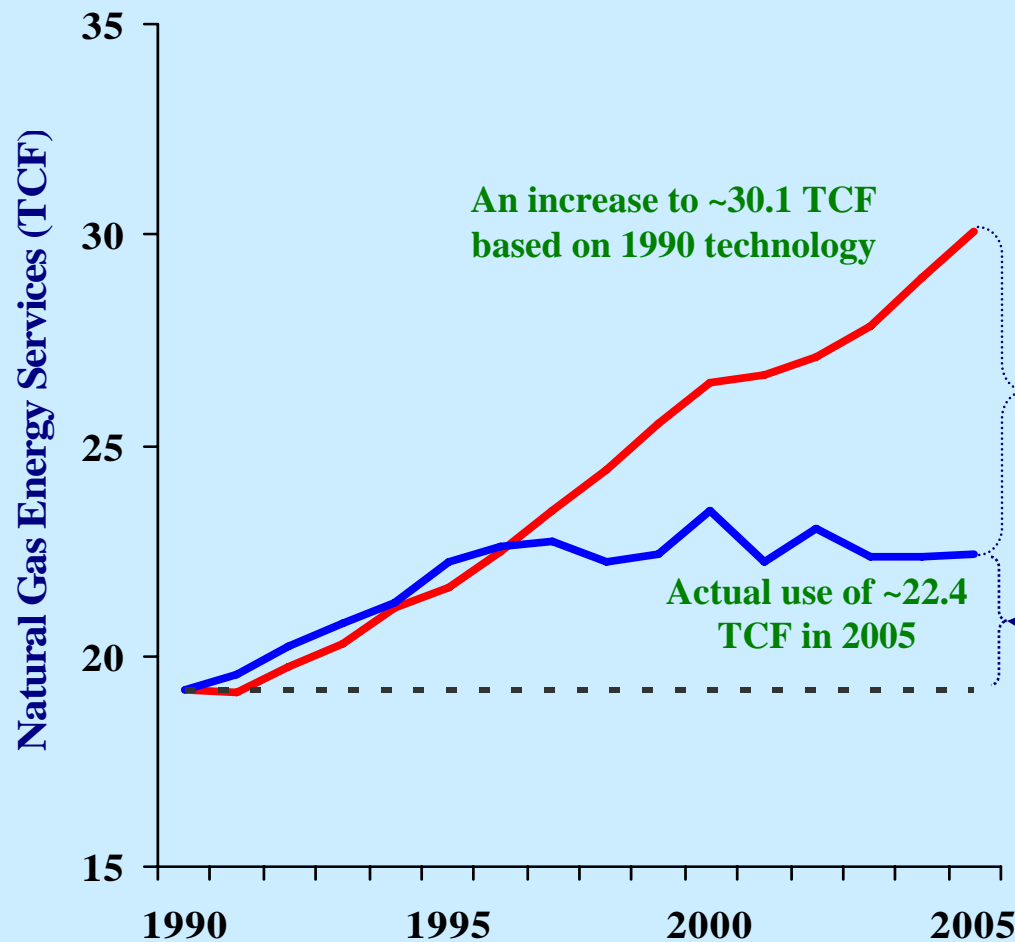
**Dr. Jeffrey S. Luke**  
*Catalytic Leadership: Strategies  
for an Interconnected World, 1998*

# Without New Efficiency Technology,\*\* Energy Use Would Be Almost 3 Times 1970 Levels



\*\* Where “energy efficiency” is broadly defined as the difference between the 1970 and 2004 energy intensities.

# Without New Efficiency Technology,\*\* Natural Gas Use Would Be ~1.6 Times 1990 Levels



## Contrast 2 NatGas Patterns

- ✓ Using 1990 Technology
- ✓ Actual Natural Gas use since 1990

*Since 1990, and especially since 1996, energy efficiency has met 72% of new natural gas service demands in the U.S, while new energy supplies have perhaps contributed only 28% of new energy service demands.*

\*\* Where "energy efficiency" is broadly defined as the difference between the 1990 and 2005 energy intensities.

## Other Useful Perspectives on Those Historical Efficiency Gains

- ❖ By 2004, improved energy efficiency (compared to 1970 technologies and market structure) was already providing 75 percent of all U.S. energy services, which is:
  - 1.3 times our total energy production
  - 8.9 times our total domestic oil production
  - 3.7 times our total petroleum imports
- ❖ *So this question, why do we always think there is more energy, but we almost always assume that the efficiency resources are already used up?*

# ACEEE's Energy Markets Research

---

---

- Began looking at markets in 2000
- Initially focused on NatGas markets
- Focused on understanding market forces
- Looked at interaction between consumption and prices
- Recently began looking a cross-fuel market effects – appear increasing dominant



# The Energy Straitjacket

---

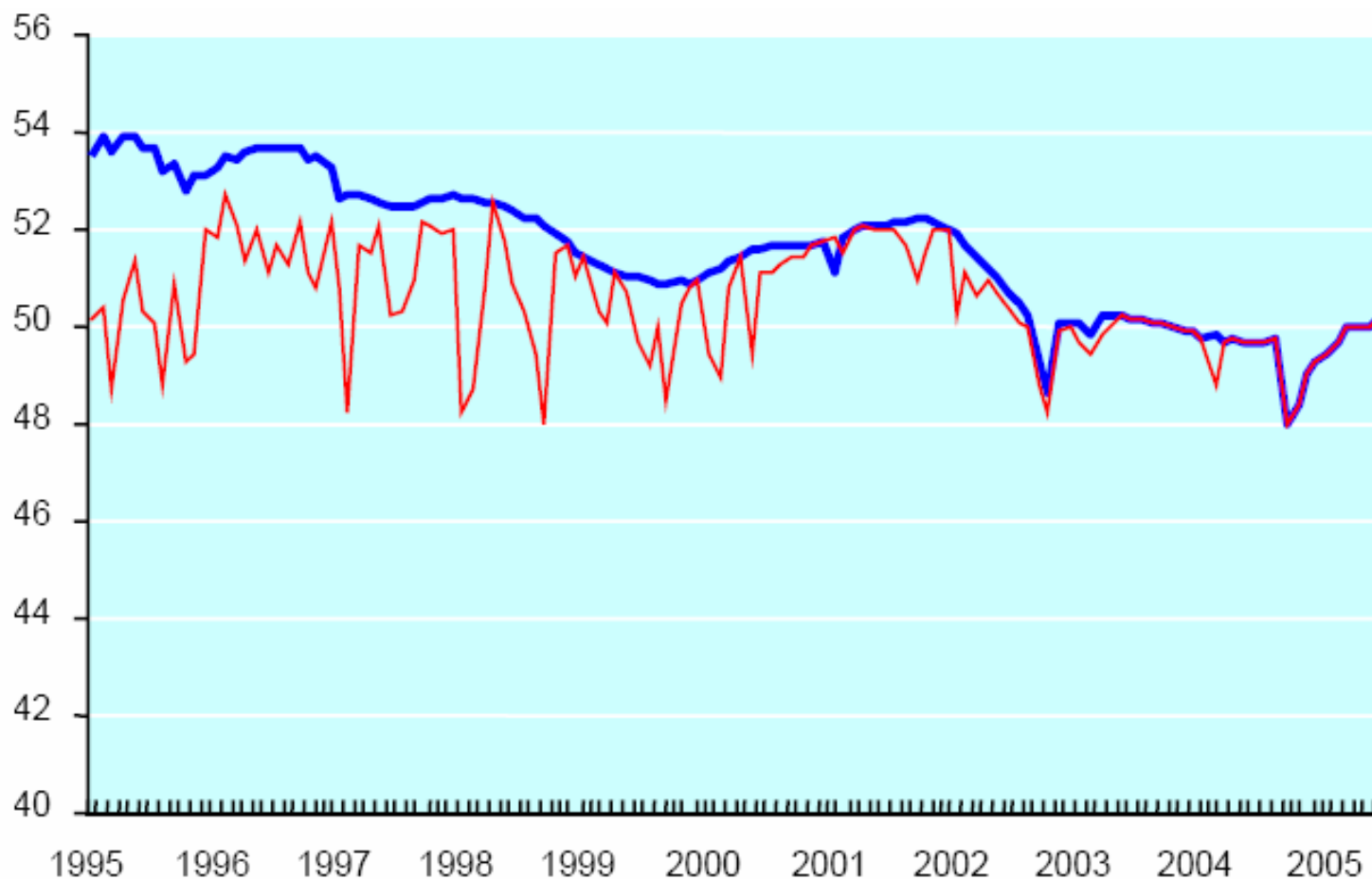
---

- No current “supply” limitations – rather “deliverability” limitations
- Demand surging in all energy markets
- Oil markets constrained by refining
- Coal markets constrained by mining and rail capacity
- Electricity constrained by available fuel
- Limited potential for fuel switching



# Natural Gas Markets

## Lower 48 Gas Production vs. Deliverability (Bcf per day)



Source: EEA 2005



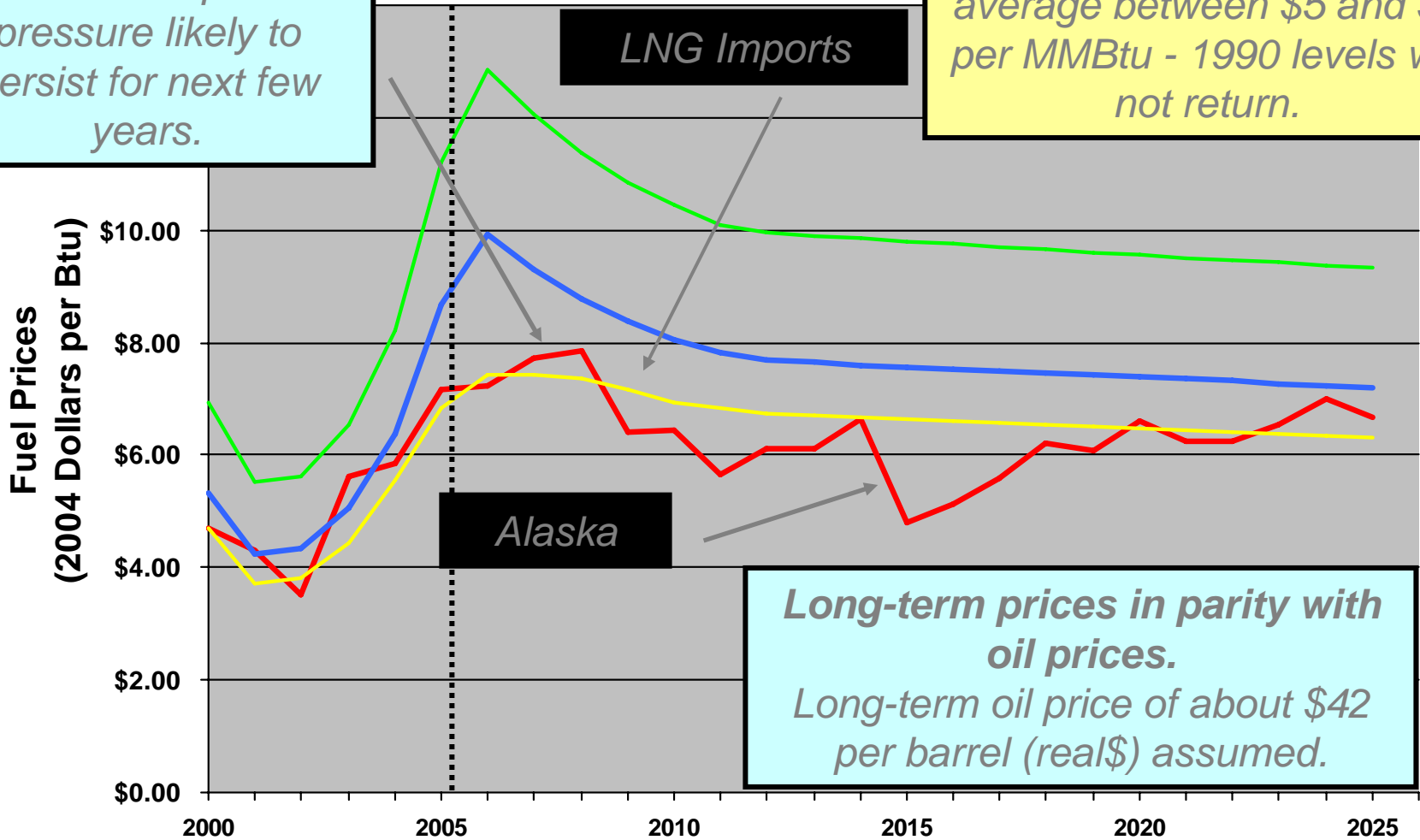


# Projected Annual Average Henry Hub Gas

## Price

*Continued price pressure likely to persist for next few years.*

*Henry Hub gas prices will average between \$5 and \$9 per MMBtu - 1990 levels will not return.*



*Long-term prices in parity with oil prices.  
Long-term oil price of about \$42 per barrel (real\$) assumed.*

Sources: Historical data from Platts Gas Daily, Projection by Energy and Environmental Analysis, Inc.



# Coal Markets Tightening

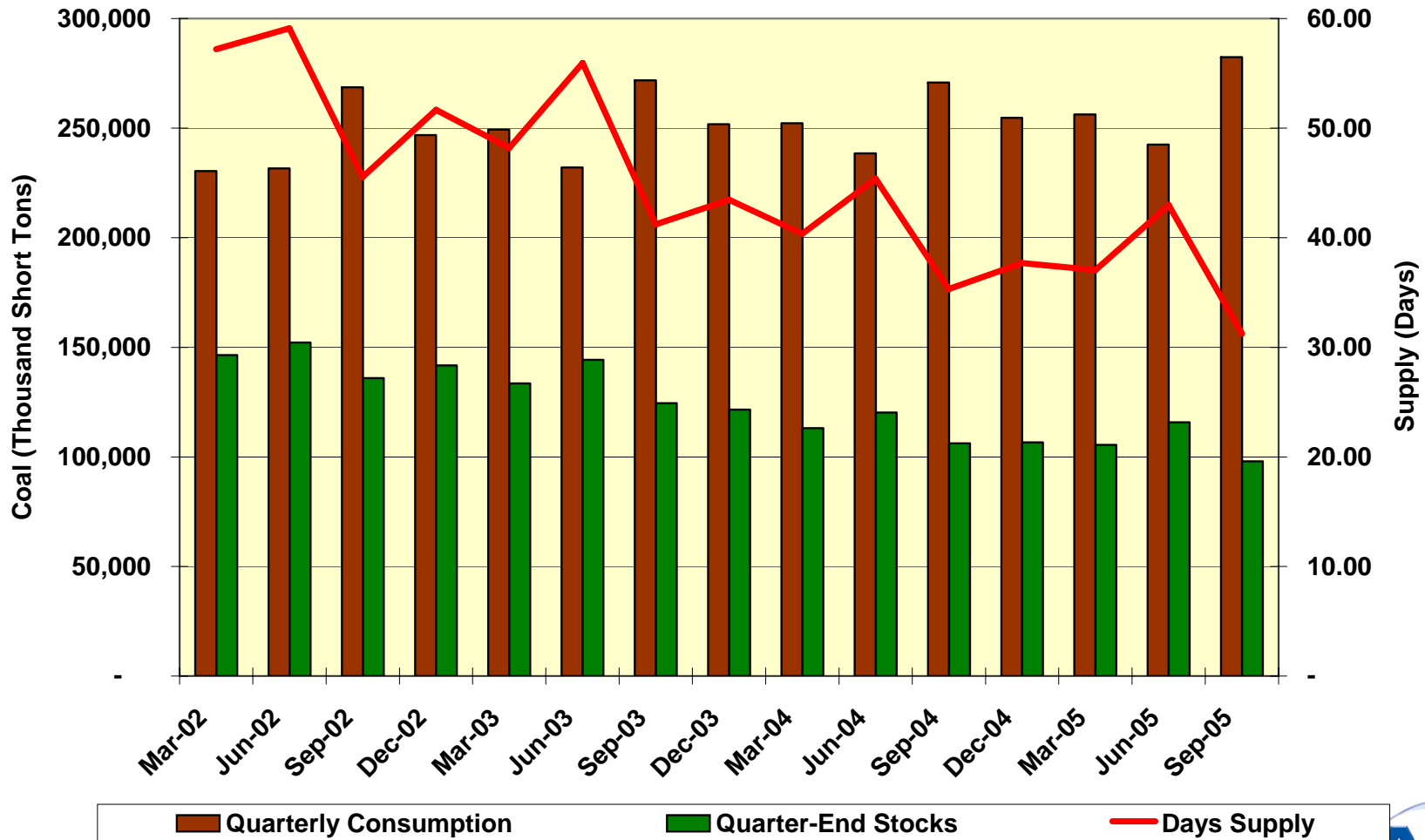
---

---

- Coal demand up on high gas prices
- Industrial consolidation reduced spare capacity – need major new investments
- Rail capacity limited – shortage of rail cars
- Later winter 2005 storms damaged western rail lines



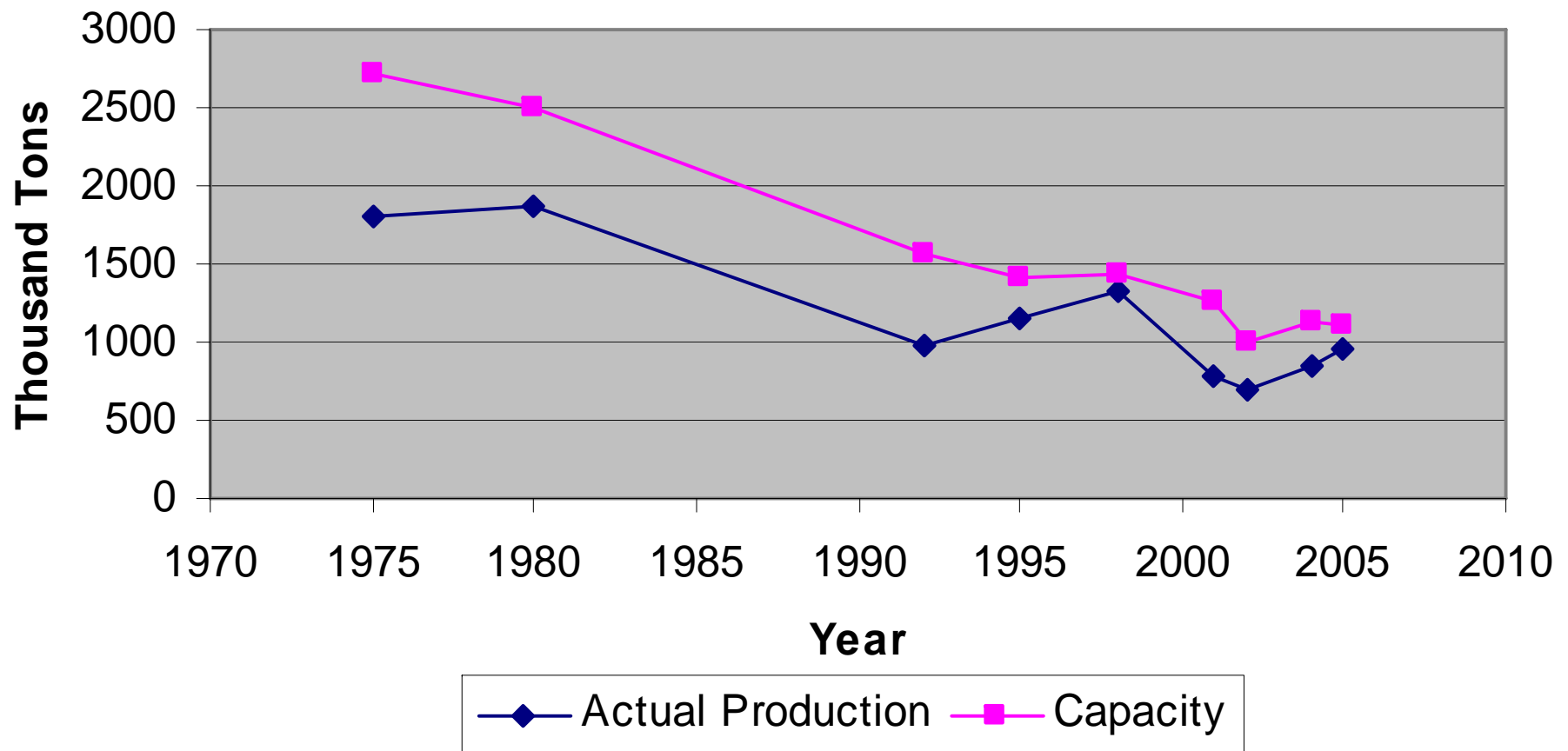
# Coal Markets Tightening



Source: ACEEE from EIA Data 2006



# Utilization of Steel Castings Limits Development of Rail Capacity



Source: Steel Foundrymen's Society of America 2005



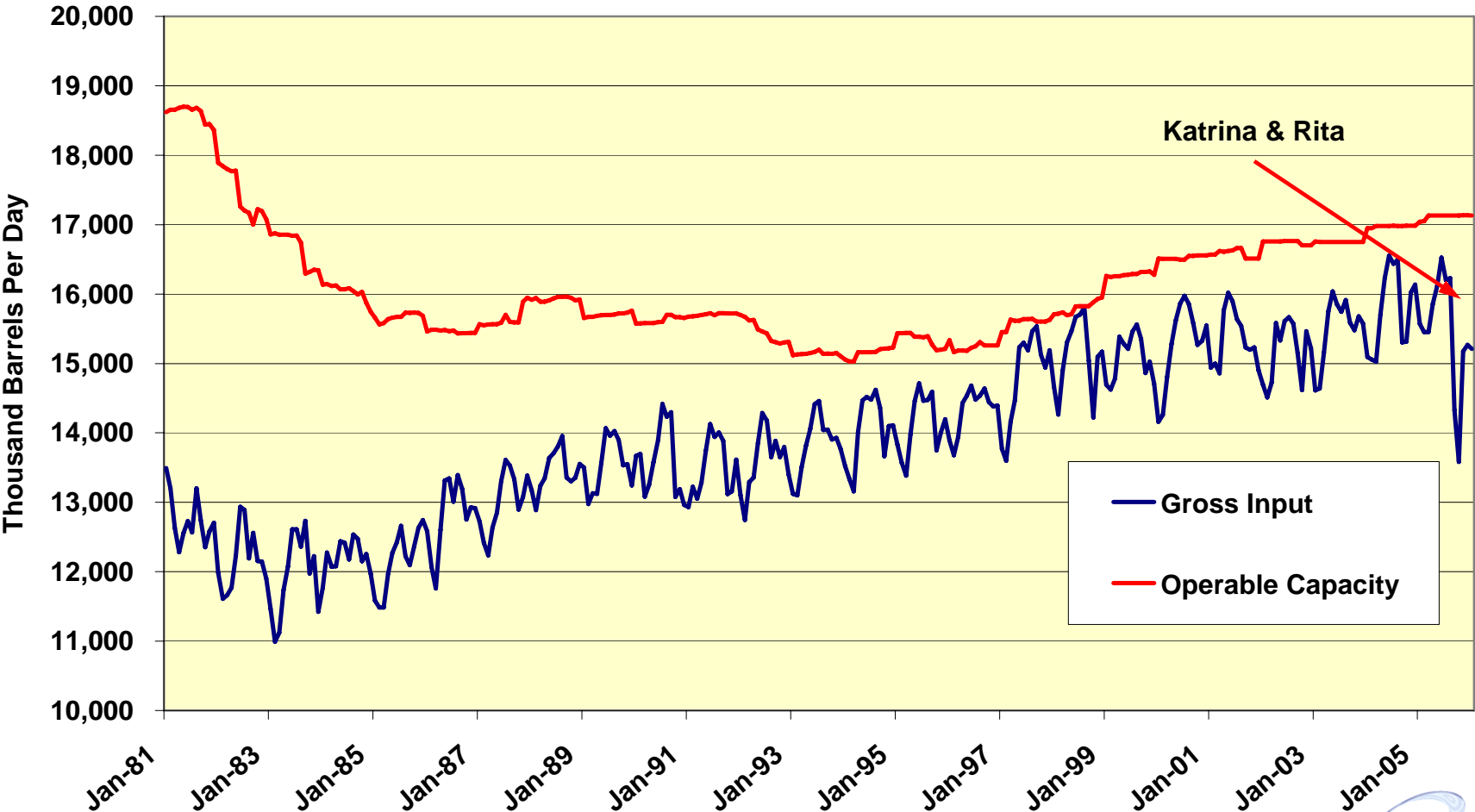
# Oil Markets Tight

- Crude Production Near Capacity
- Refined Products Very Tight
- Limited Refining means Competition between Refined Products – Gasoline and Distillate
- Markets Vulnerable to Disruptions – Storms, instability, terrorism
- Global Price Driven by Increasing Demand in U.S., China and India



Thunder Horse

# Refining Capacity vs. Production



Source: EIA 2006



# The Weather Wild Card

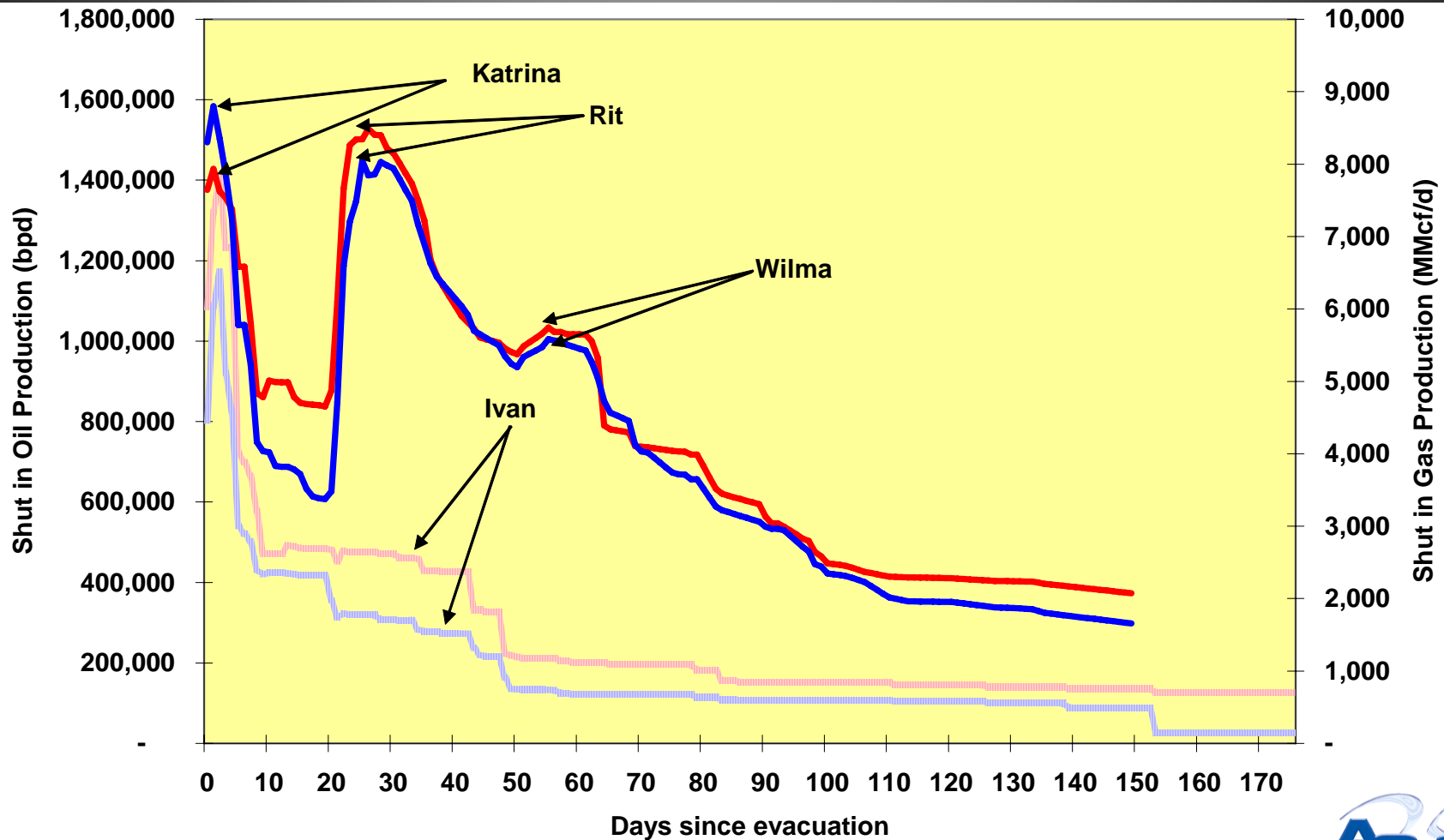
---

---

- Extreme weather affects production of oil, gas and coal
  - Late winter snows disrupted western coal
  - Hurricanes disrupted both production and processing
- Extreme weather increases demand
  - 3 cool summer and 4 warm winters
  - Summer 2005 ~4% above “normal”, but >75% warmer than 2004
  - We have had a warm fall, cold December, and warm January



# Impacts on Oil & Gas Production

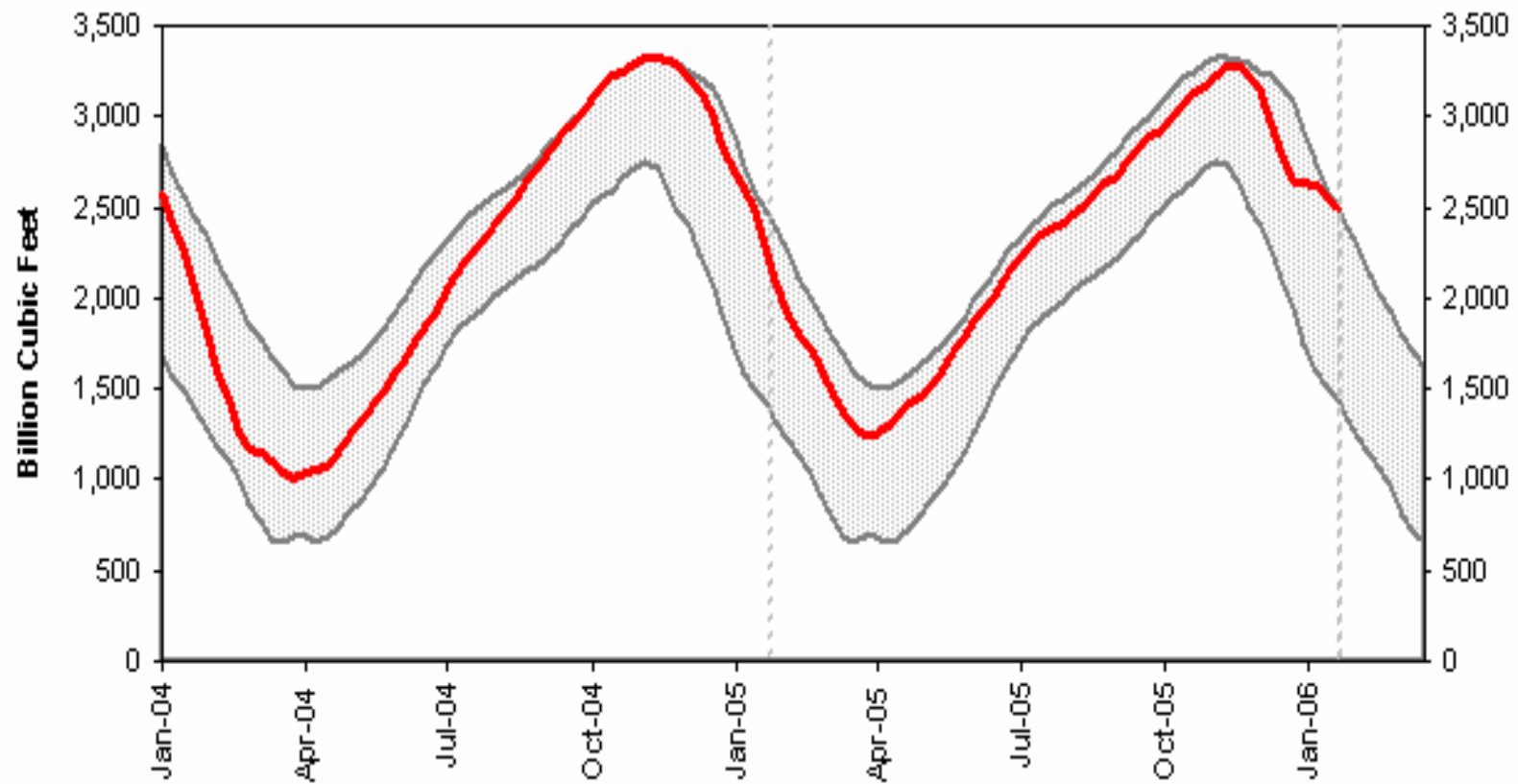


Source: DOI Minerals Management Service 2005-2006





# Natural Gas Storage



Source: EIA 2006



# Role for Energy Efficiency

---

---

- If modest increases in demand produced large price increases, then small decreases should produce large price reductions
- Efficiency energy can produce savings in both the near-term and longer-term



# Characterizing the Energy Efficiency Resource

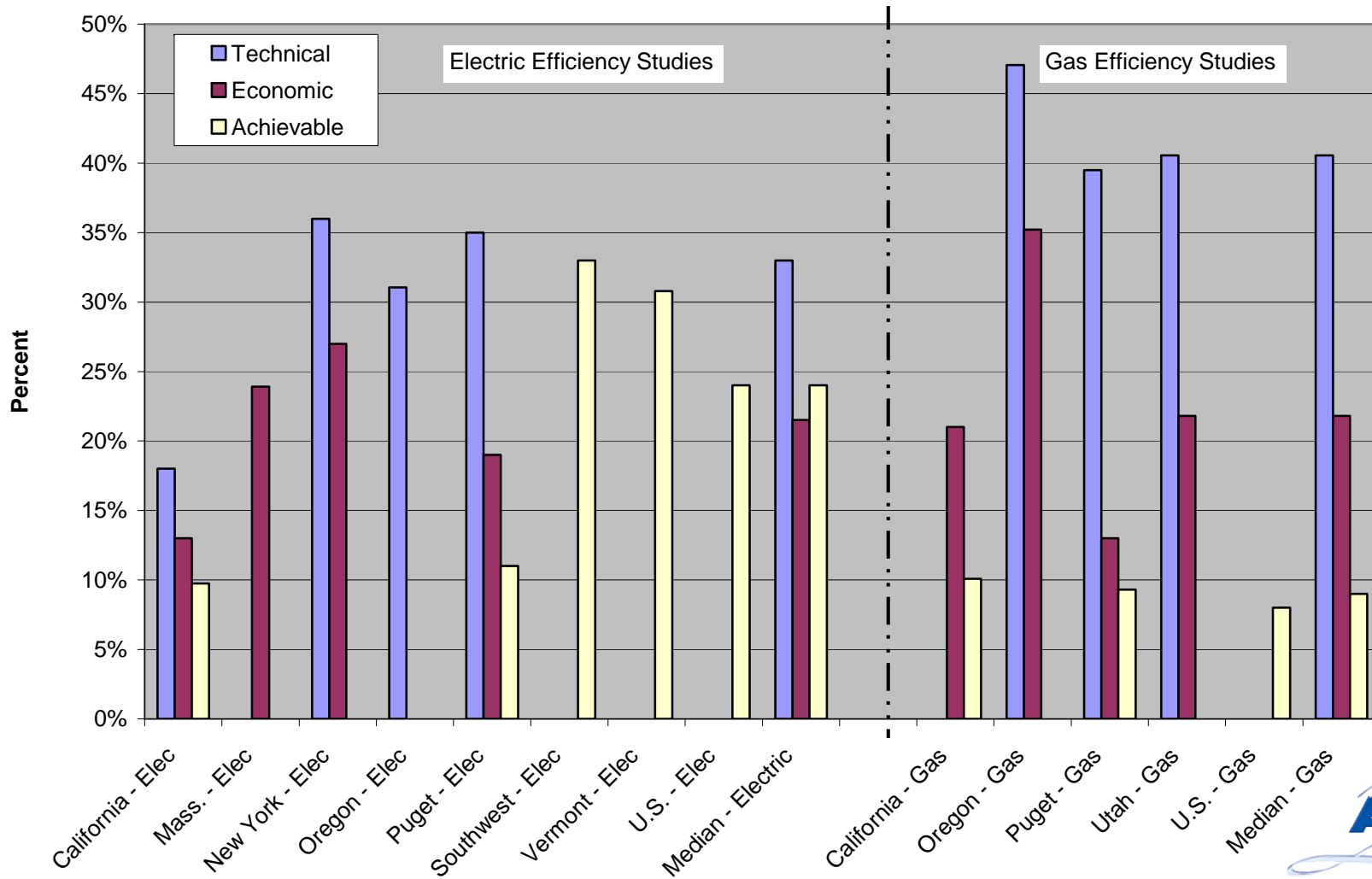
---

---

- Variety of studies done in late 1980s/early 1990s on technical, economic and achievable energy savings potential
- Few such studies in late 1990s
- Beginning in 2000, a resurgence of such studies
  - First time in some regions
  - Revise/reassess earlier studies in other regions



# Summary of Recent EE Studies



# Savings Achieved from Most Effective Electric Programs

	Year	Annual Incremental GWh Savings	kWh Sales	Savings/Year (%)
California	2001	4,760	239,654	2.0%
	2002	1,463	235,249	0.6%
Connecticut	2001	314	30,000	1.0%
	2002	246	31,000	0.8%
Massachusetts	2000	273	51,773	0.5%
	2001	309	52,092	0.6%
Rhode Island	2001	61	7,341	0.8%
	2002	51	7,516	0.7%
Vermont (Efficiency VT only)	2001	37	5,051	0.7%
	2002	41	5,077	0.8%
	2003	54	5,127	1.1%



# Significant Opportunities For Energy Efficiency

---

---

- Studies show significant economic potential for efficiency
- Actual experience shows saving of 10% readily achievable
- Best companies achieving average of 1% per year efficiency improvements (above autonomous trend)



# ACEEE Research Approach

---

---

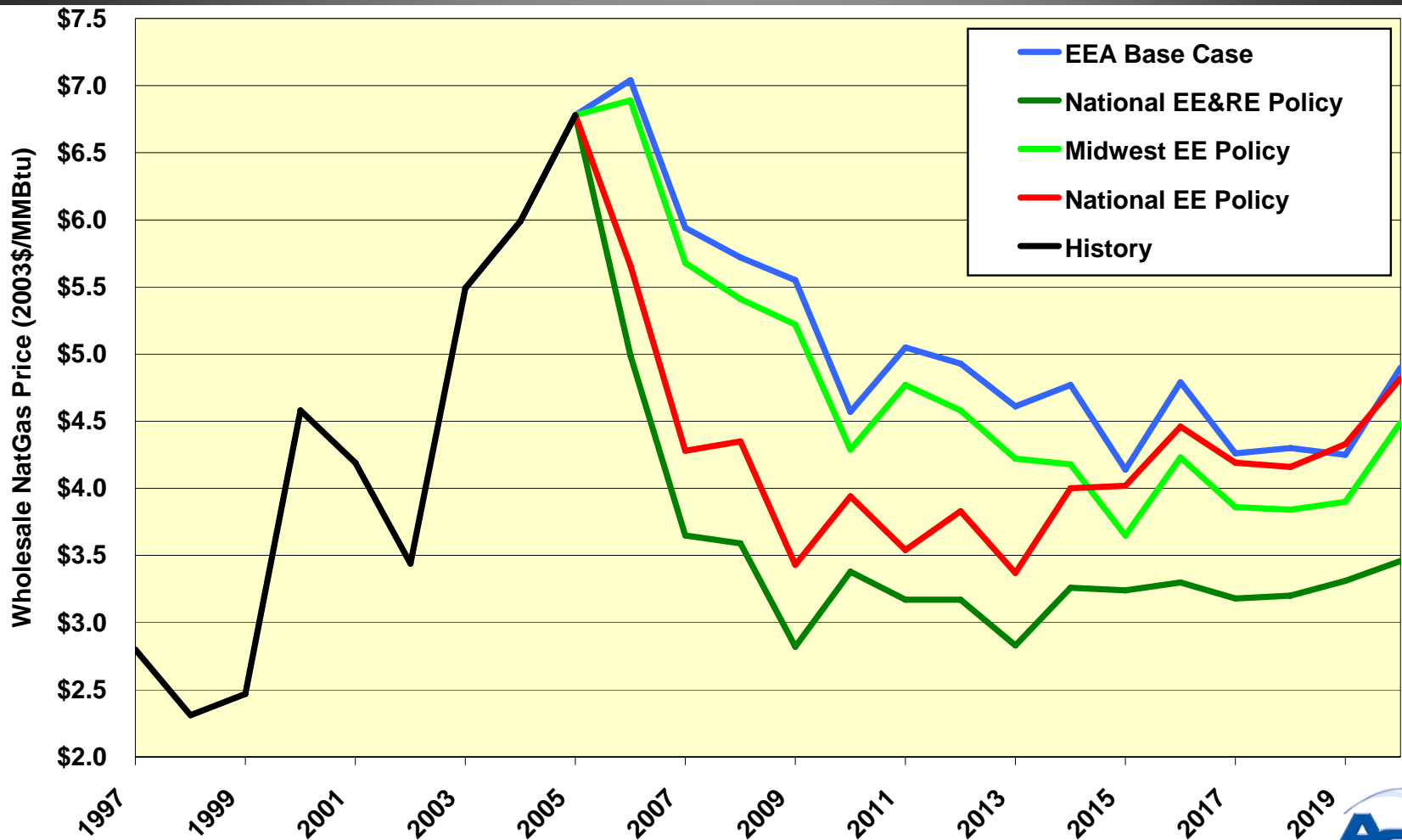
Sector estimates by State of the near-term implementable potential for energy efficiency and conservation programs for:

1. End-User Natural Gas
2. End-User Electricity

Calculated “reasonably achievable” savings based on sector end-uses (i.e. space heating, motors, lighting...)



# Impact of EE & RE on Henry Hub Natural Gas Pricing



Source: EEA 2004 and ACEEE 2005





# Results of Gas Analysis

---

---

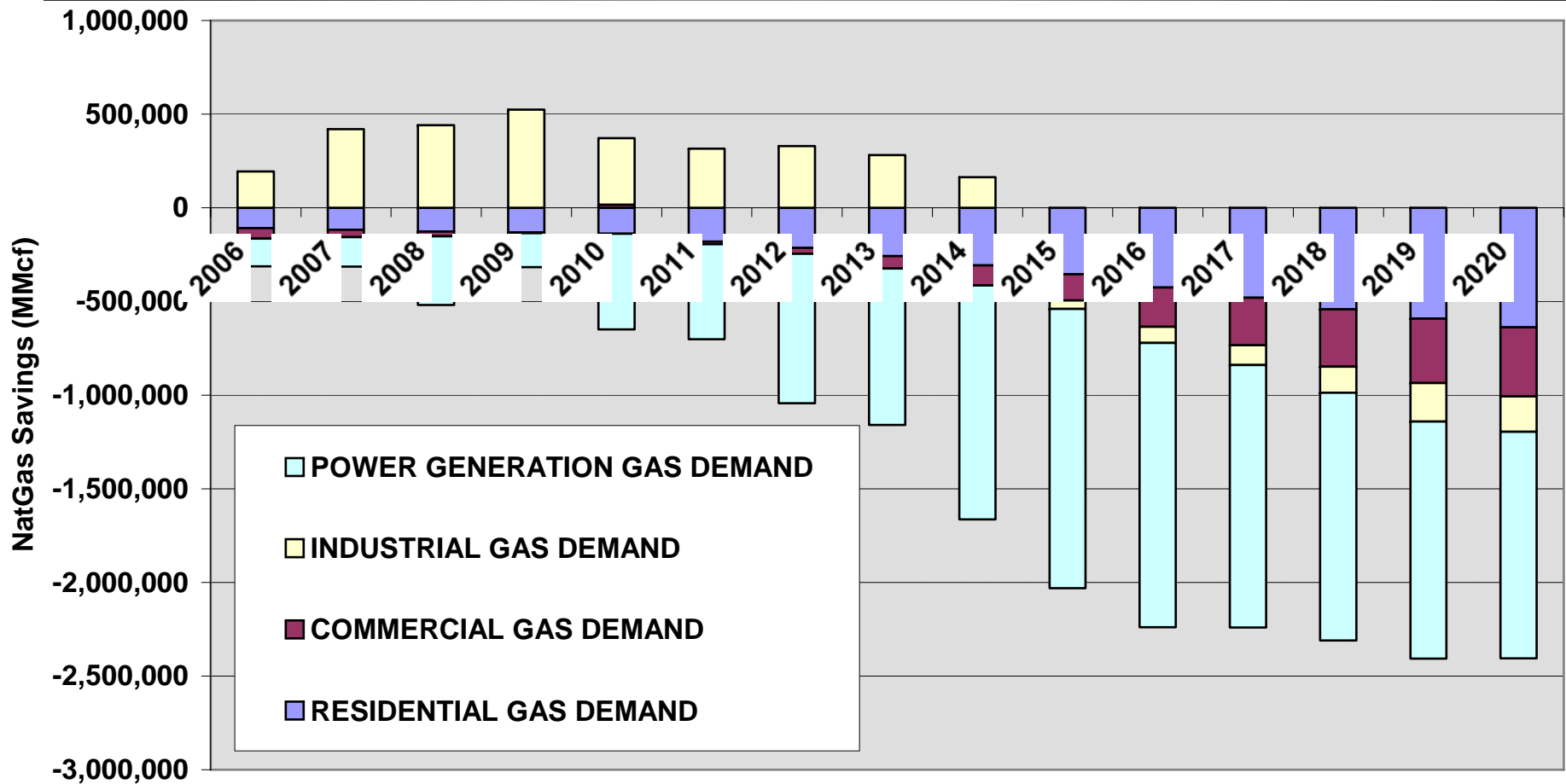
- Electric savings more important than direct use because of multiplier effect

(NatGas generation on margin >11,000 Btu/kWh)

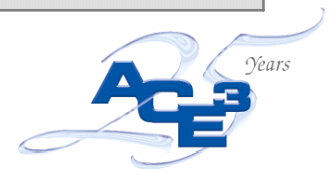
- Efficiency should be treated as a resource on par with conventional supply
- Efficiency alone can't address demand growth – need additional supply resources
- Don't use an explicit elasticity – Price effects decline as market rebalances



# Gas Consumption Reductions from Energy Efficiency



Source: ACEEE 2005



# How Has the NatGas Market Actually Responded?

---

---

- Extreme weather has had a dominant impact masking any other effects
- World crude running above forecasts
- Other markets have tightened
- Electric power increasingly driving NatGas market prices



# Research Findings

---

---

- Focus on a single fuel may produce misleading results – markets increasingly linked
- With tightening markets, volatility driven by natural demand fluctuations (e.g., weather)
- Beware of using past trends to predict the future – markets are fundamentally different today

***“Past performance not indicative of future results”***

- Simplistic approach to price response may produce misleading results, particularly in near-term



# Conclusions

---

---

- Energy efficiency may be our only available marginal energy resource
- We can't sustain current rate of energy demand growth
- We need to decouple energy services from energy consumption



# Contact Information

---

---

**R. Neal Elliott, Ph.D., P.E.**

Industrial Program Director

**ACEEE**

1001 Conn. Ave, NW, Suite 801

Washington, DC 20036

202-429-8873

[rne Elliott@aceee.org](mailto:rne Elliott@aceee.org)

For more information and updates on Natural  
Gas and Energy Efficiency visit:

<http://aceee.org/energy/natlgas.htm>

