

# **Framework of Factors Controlling the U.S. Natural Gas Market Outlook\***

**Jeremy Platt<sup>1</sup> and Steve Thumb<sup>2</sup>**

Search and Discovery Article #70056 (2008)

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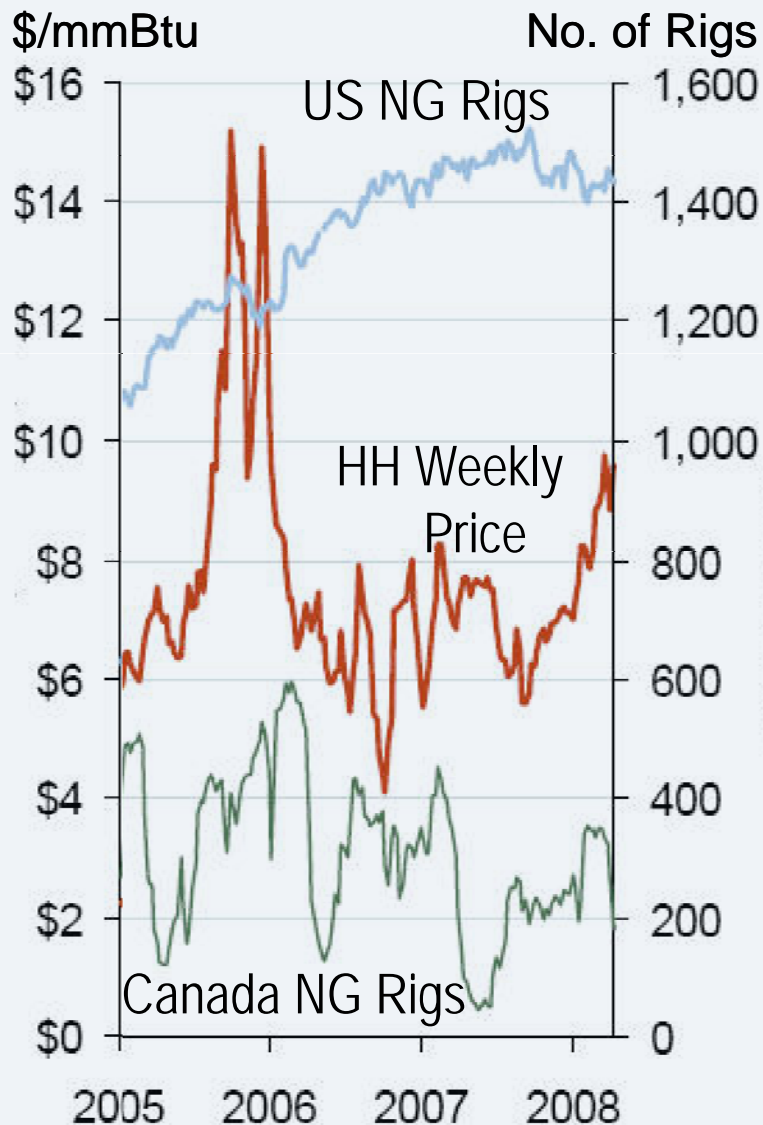
\*Adapted from oral presentation at AAPG Annual Convention, San Antonio, Texas, April 20-23, 2008

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## **Abstract**

The price of natural gas has transcending importance in the new energy economy. Seemingly linked at times to oil, in 2007 its price (in the U.S.) has fallen below 50% of parity with WTI. Its price marches to a different drummer. This presentation summarizes research by the Electric Power Research Institute on the key factors shaping the natural gas supply-demand balance and price envelope over the intermediate term. The greatest single factor is the surge in LNG imports anticipated during 2008 and continuing thereafter. Also important is the outlook for U.S. gas production, which at record drilling levels has begun to increase. This is a significant turnaround from trends since 2000. Results from the Lippman Gas Supply Model quantify scenarios of drilling, in which the industry's response to softening prices is an important question. On the negative side of the ledger are anticipated declines in imports from Canada, largely already realized and responding to Canada's drilling-production cycles, oil sands' requirements, and schedule for replacing coal-fired power generation. Over the next 3-4 years, the balance of these factors leads to a price-softening outlook; yet this will likely be followed by the opposite when, first, gas demands for power generation increase unexpectedly on account of the recent wave of withdrawals of proposed coal plants, and, second, the difficulties of tapping Arctic supplies constrain needed supplies. The resulting topsy-turvy outlook will be a challenge to technology planners, policy makers, and investors in the power, natural gas, and alternative energy industries.



FERC Market Oversight, Updated April 4, 2008



ELECTRIC POWER  
RESEARCH INSTITUTE

## Framework of Factors Controlling US NG Market Outlook

**AAPG EMD Forum on Economics of Natural  
Gas and Alternative Energy**

April 21, 2008

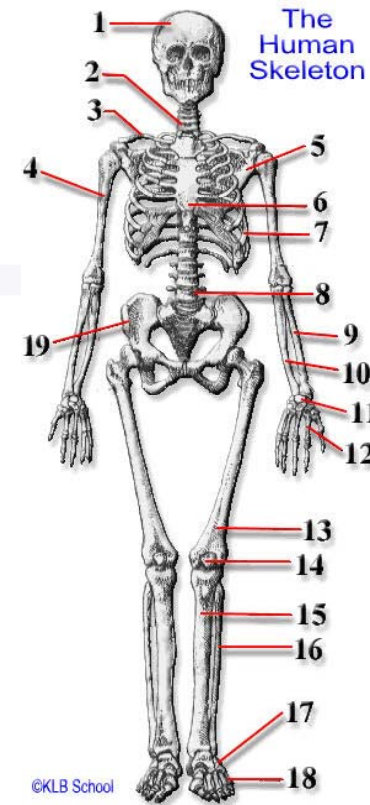
**Jeremy Platt<sup>1</sup> and Stephen Thumb<sup>2</sup>**

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# Topics

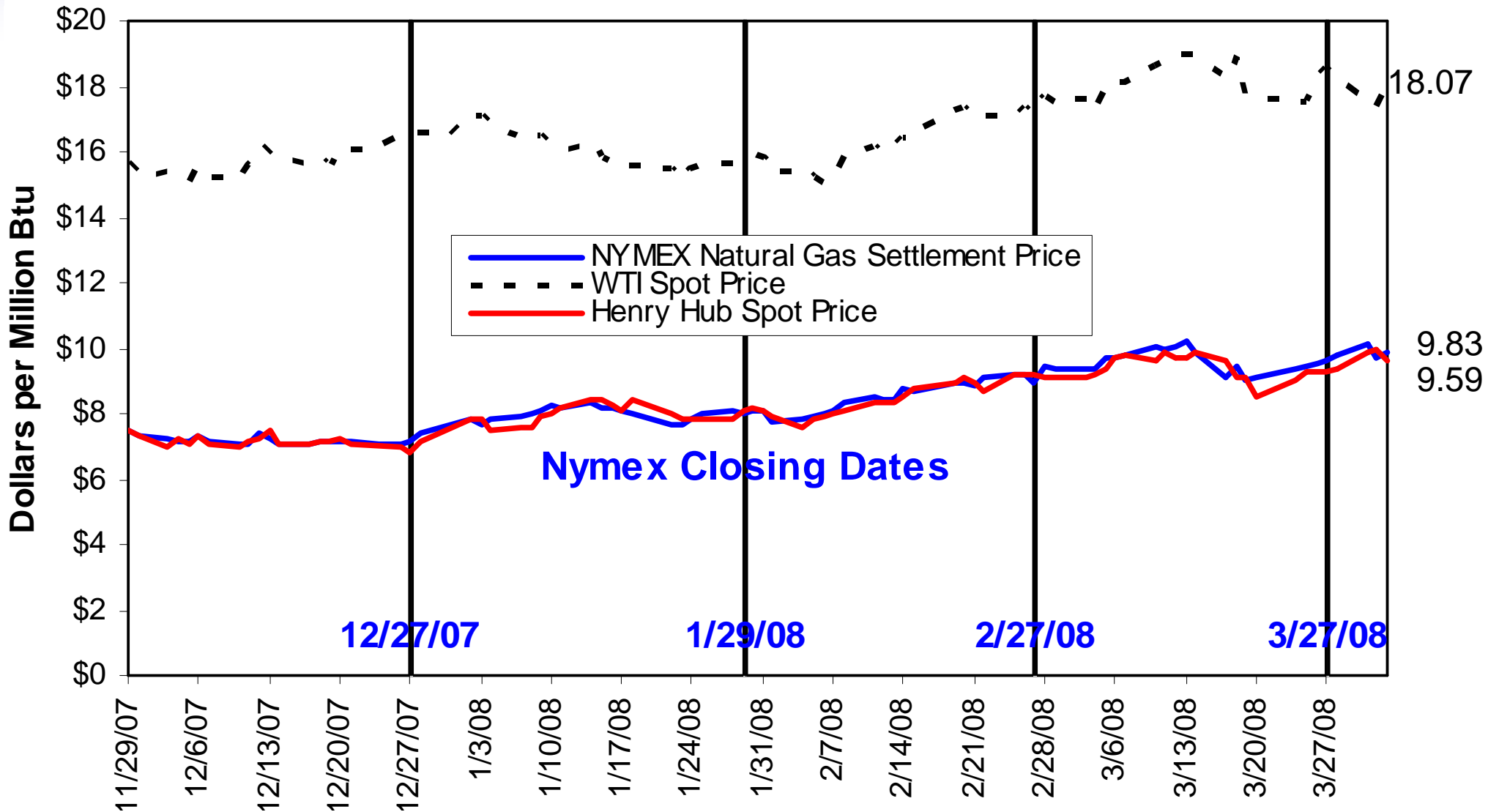
- NG-Oil price and market synopsis
- Framework of factors
  - Sensitivities
- Topsy-turvy price outlook
- What to watch



# NG-Oil price and market synopsis

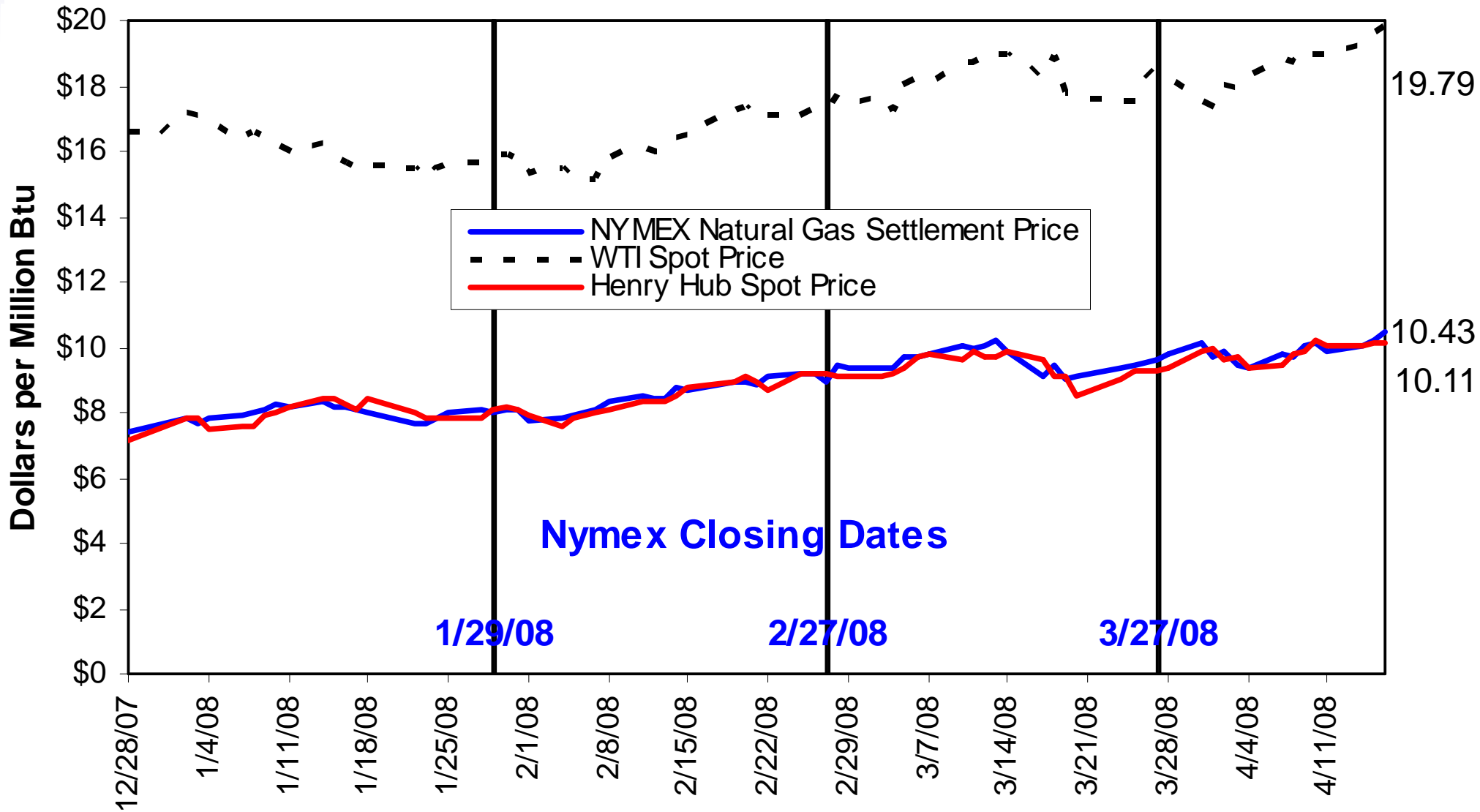
- Sharp break from oil prices
- Power sector – only sector with growth

# NG About 50% Oil Price



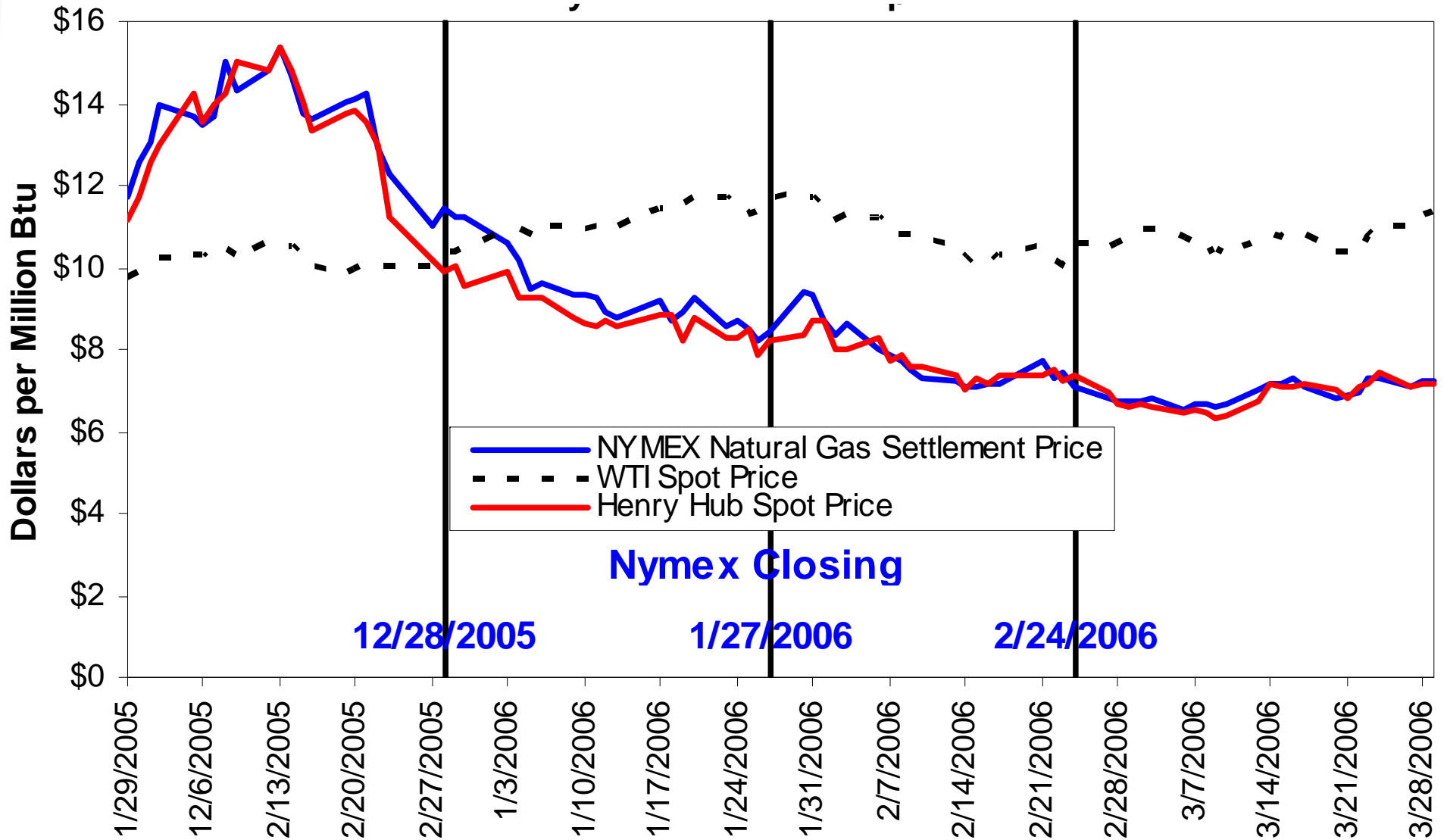
SOURCE: EIA NATURAL GAS WEEKLY UPDATE: April 3 2008

# NG About 50% Oil Price



SOURCE: EIA NATURAL GAS WEEKLY UPDATE: April 17 2008

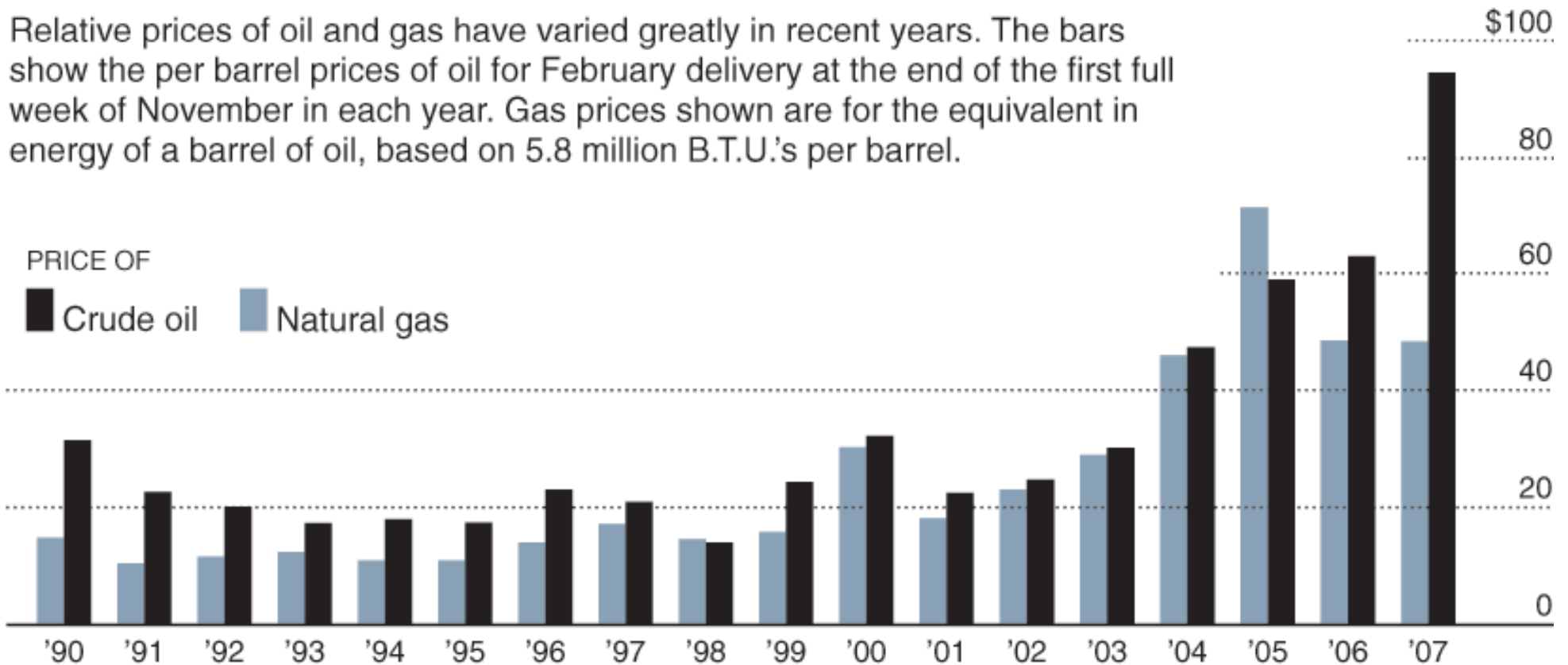
# The Split Began in 2006



SOURCE: EIA NATURAL GAS WEEKLY UPDATE: March 30 2006

# Oil-Gas Price Relationships Over Time

Relative prices of oil and gas have varied greatly in recent years. The bars show the per barrel prices of oil for February delivery at the end of the first full week of November in each year. Gas prices shown are for the equivalent in energy of a barrel of oil, based on 5.8 million B.T.U.'s per barrel.



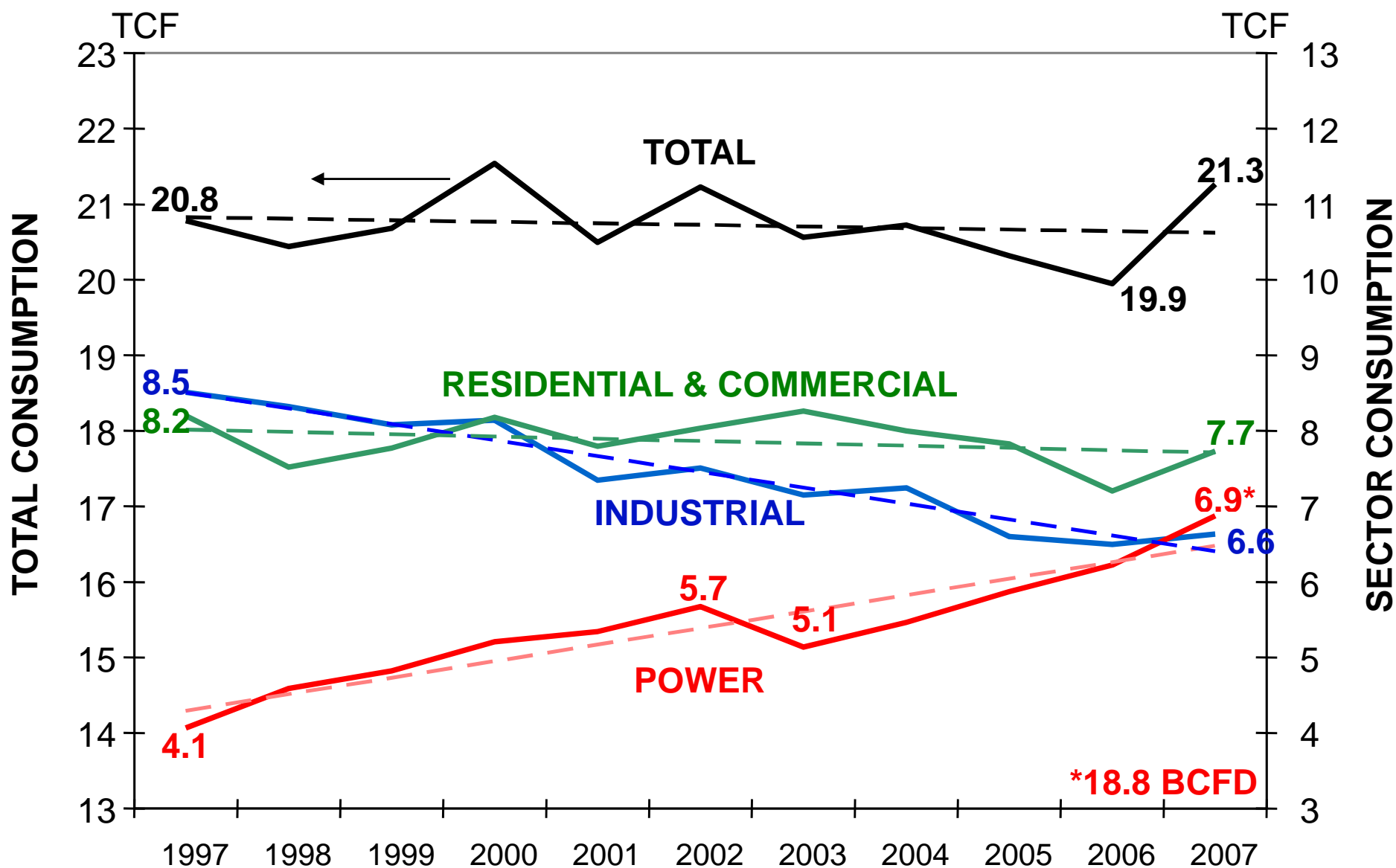
Source: Bloomberg Financial Markets

THE NEW YORK TIMES

SOURCE: NEW YORK TIMES, Nov. 10, 2007 "As Oil Soars...", p.1ff. Business Section



# Consumption Trends 1997-2007: Demand Destruction and Power Sector Growth



SOURCE: EIA

# Framework of Factors

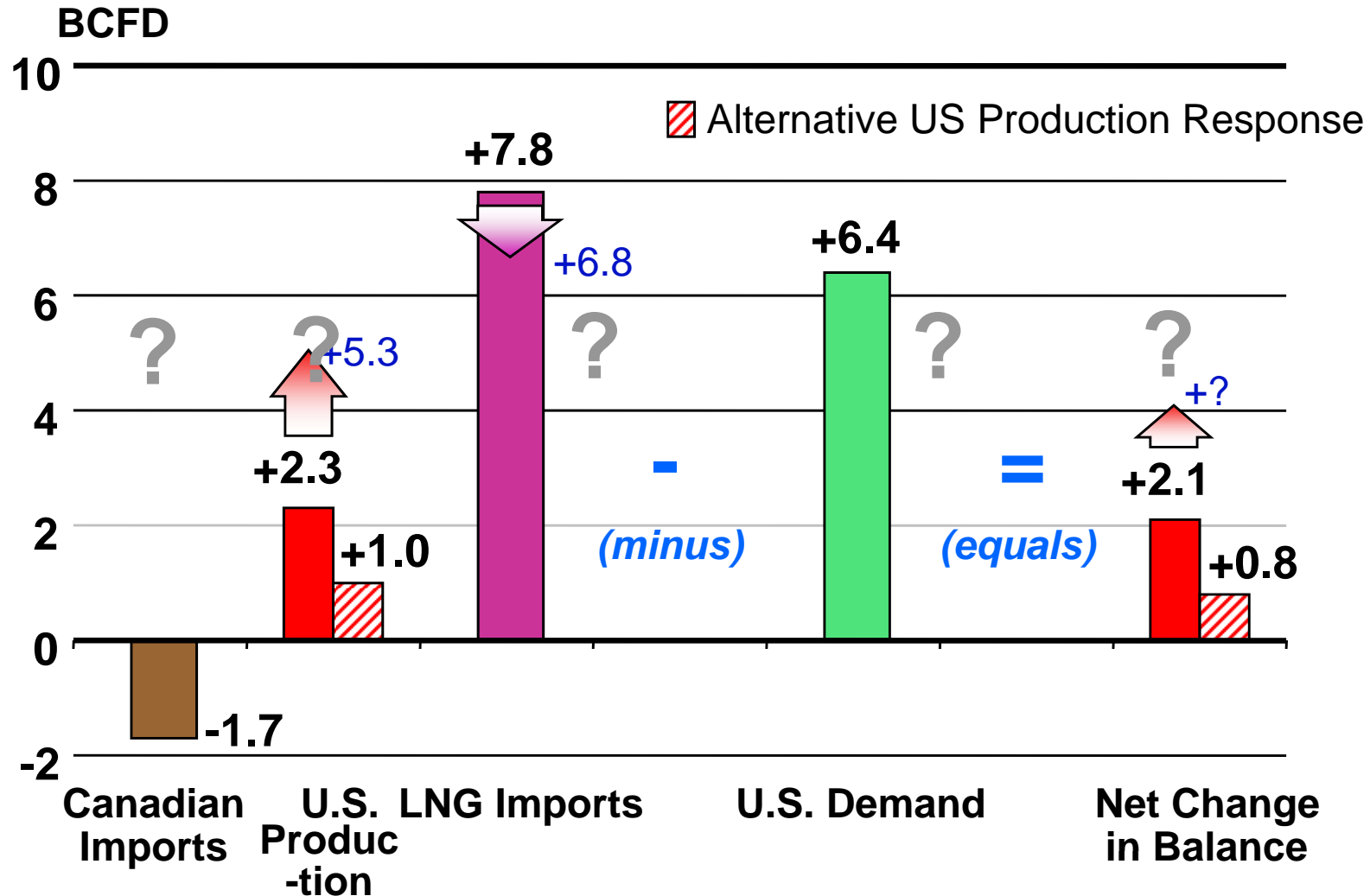
- The factors (biggest changes in supply and demand)
- US production scenarios
- Canada
- LNG
- Power sector demand for NG

## Principal references

- Nov 2007: *US Natural Gas Supply Equation and Price Envelope*. 1014146.
- Feb 2008: *Global Natural Gas Market Analysis*. 1014921.
- Oct 2007 article: “Impacts of Coal Plant Withdrawals on NG Markets...”

# Framework of Factors Shaping US NG Market

## Possible Changes in US Gas Supply and Demand Balance, 2005-2011

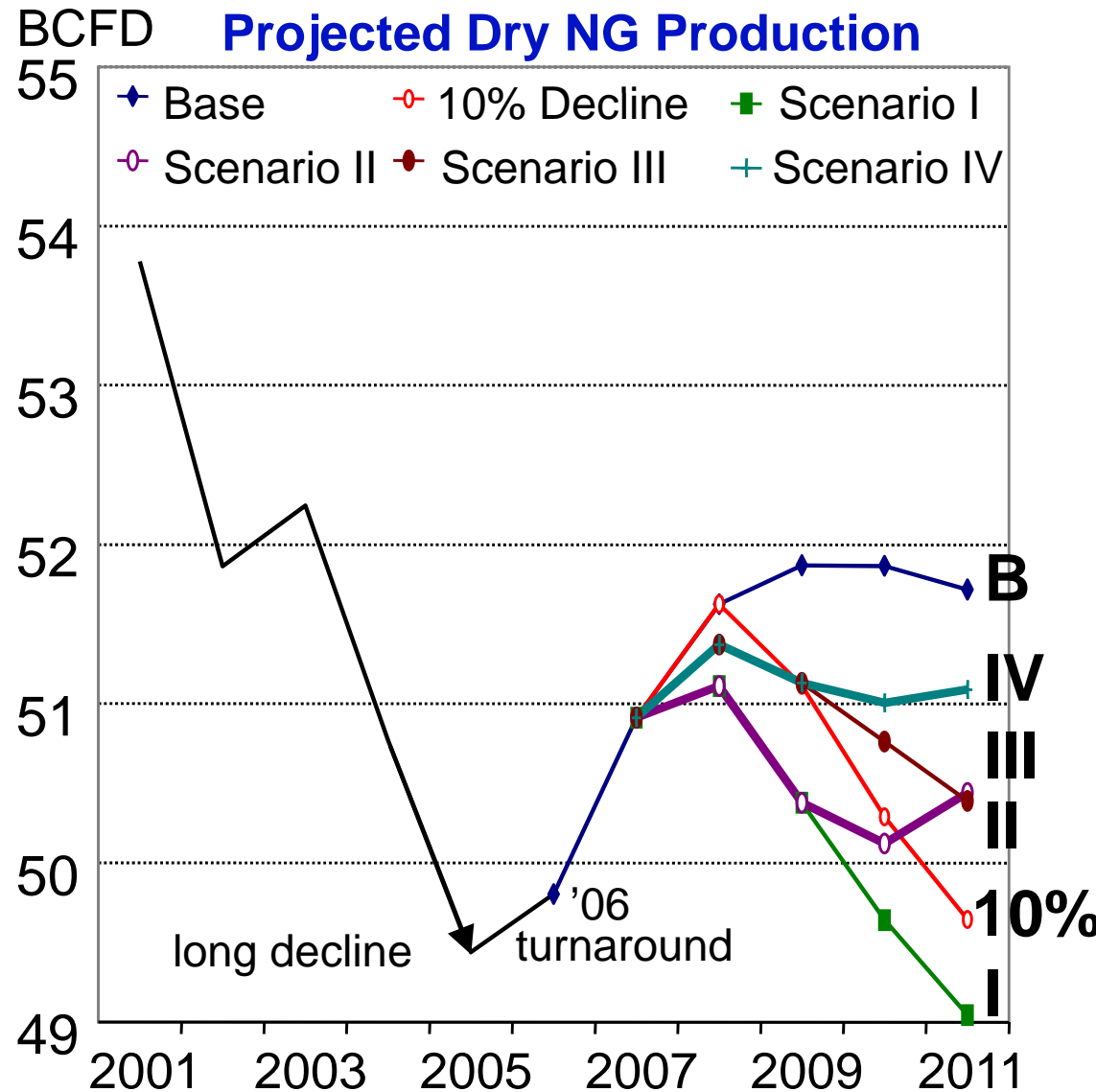


SOURCE: EPRI, *US Natural Gas Supply Equation and Price Envelope*, 2007. 1014146

# US Production: Drilling Scenarios

- **Base Case:** Continued record drilling
- **10% Decline:** -10% in all regions in '09, stay at that level 2010-2011
- **I:** -10% ('08) and -20% ('09) for conventional NG only, then flat. No change for unconventional. Middle range for mixed areas.
- **II:** Rebound 2010-11
- **III:** ½ the decline Scenario I
- **IV:** Scen. III with rebound

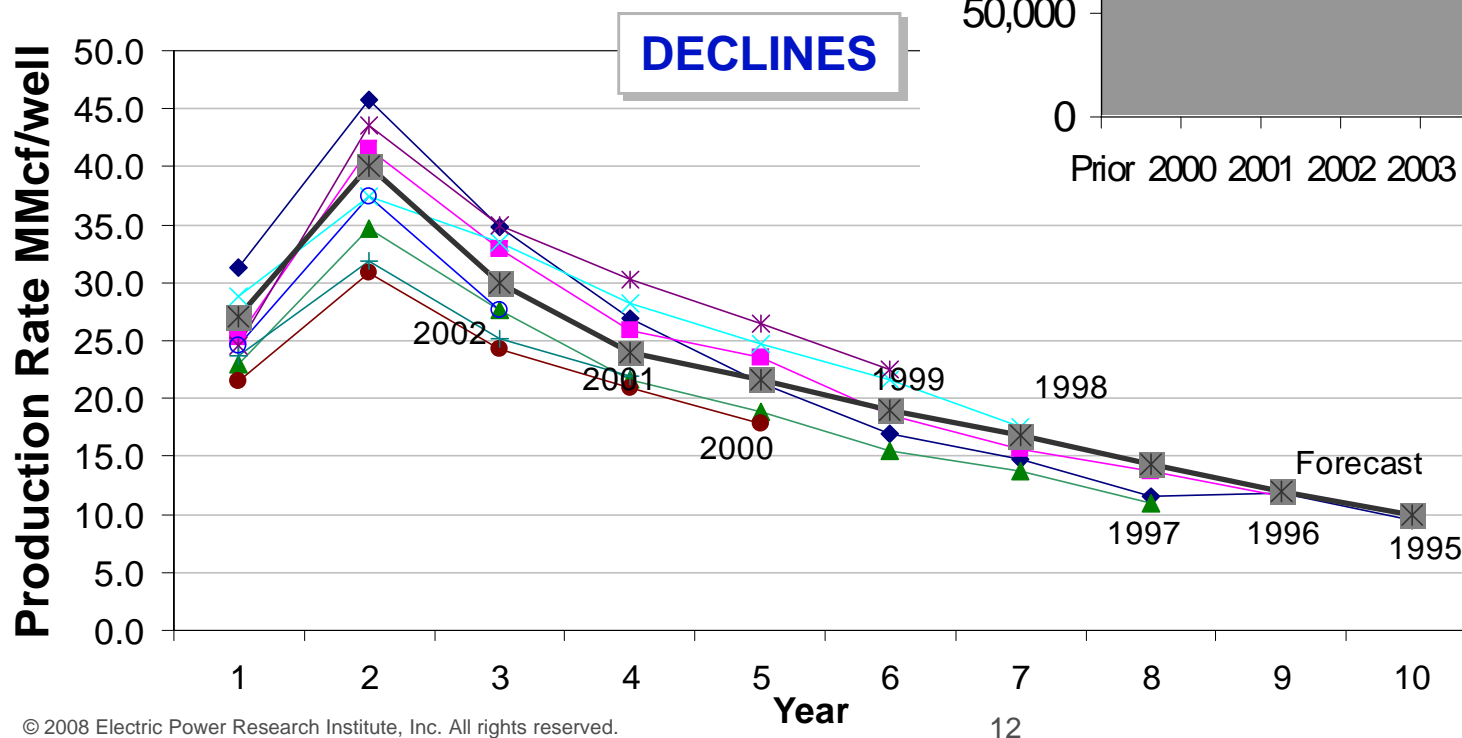
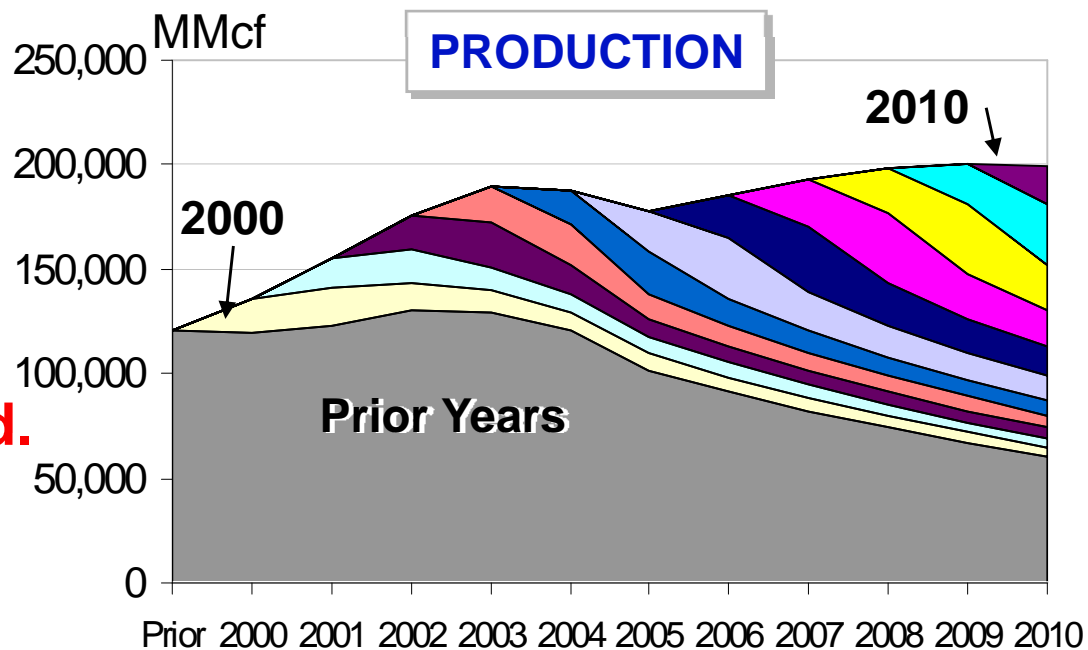
SOURCE: EPRI, *US Natural Gas Supply Equation and Price Envelope*, 2007. 1014146



# US Production Analysis: Based on Lippman Gas Supply Model

- Play by play analysis of regional production by well vintage and estimated declines
- 150 performance curves

**Example: Colo. Wattenberg Fld.**



SOURCE: G. Lippman presentation to Nov. 2006 EPRI-EEI Power & Fuel Supply Seminar.

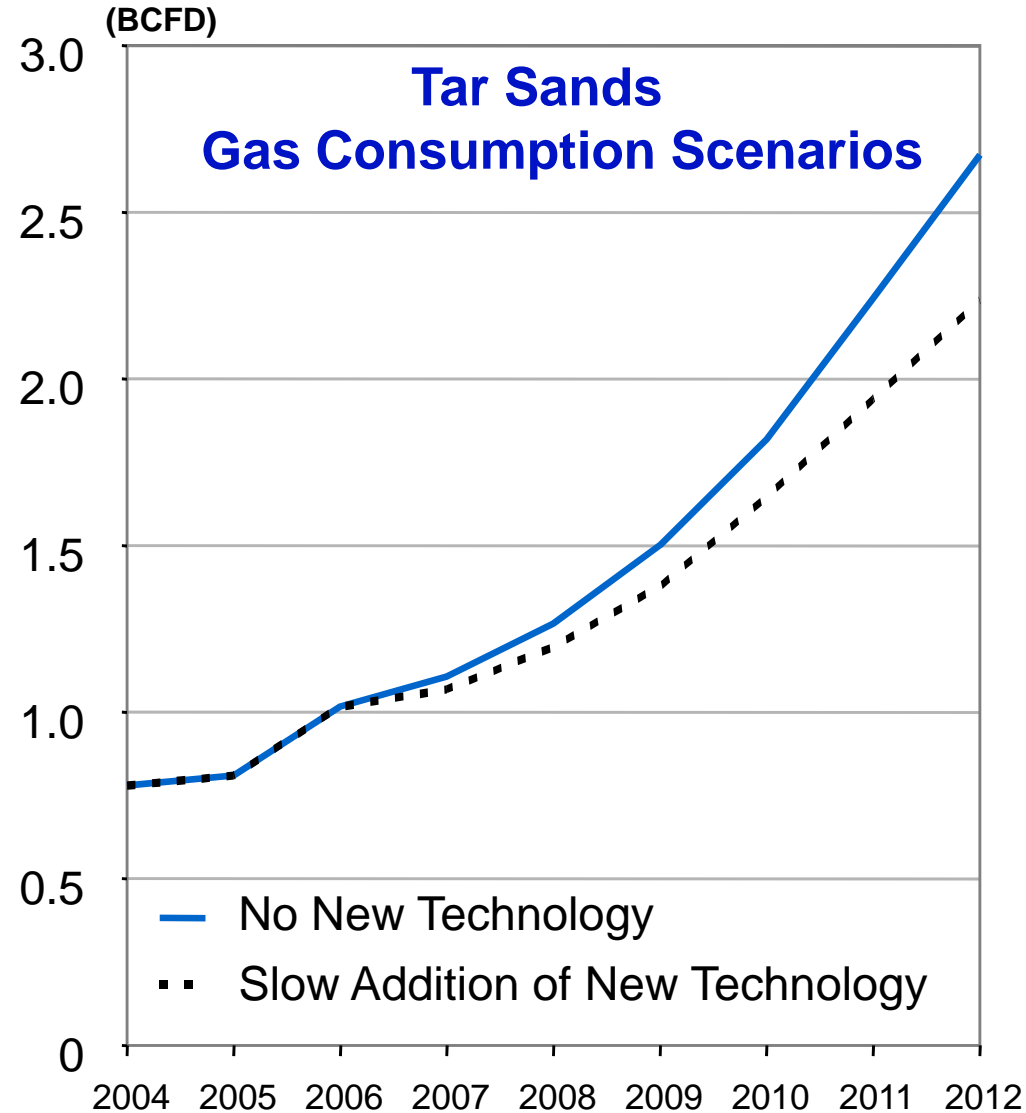
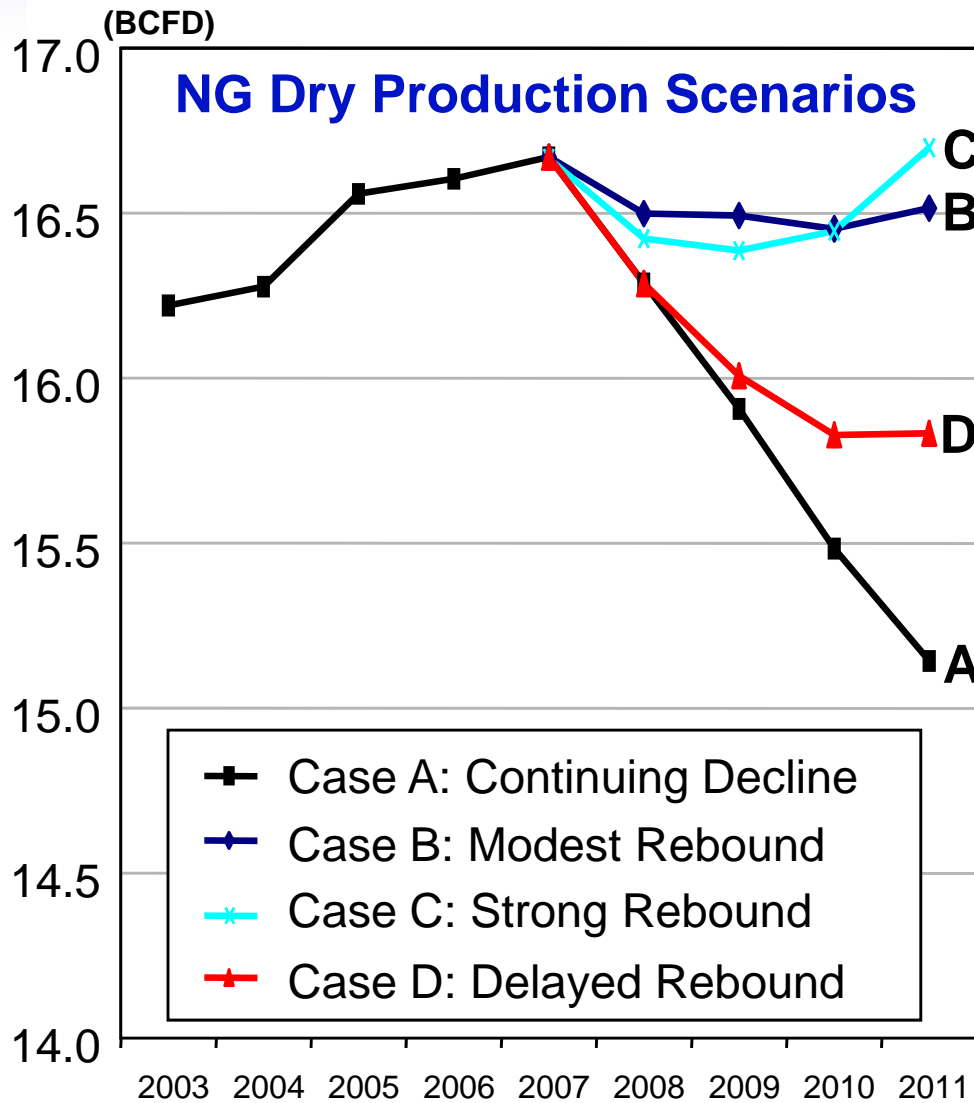
# US Production: Projected Increases by Region (Base Case)

LATEST VIEW, APRIL 2008

Region	2005-2011 Change (BCFD)		
Gulf of Mexico			
Onshore	(2.3)	<b>0.2</b>	Declining drilling activity; high decline rates.
Offshore	(0.4)	<b>(2.2)</b>	Increased drilling activity; mixture of trends.
Mid-Continent	2.8	<b>4.8</b>	Barnett, Fayetteville & Woodford shales; increased drilling activity.
Rocky Mountains	2.5	<b>2.8</b>	Tight sands and coalbed methane; increased drilling activity.
Permian Basin	(0.1)	<b>(0.0)</b>	Increased drilling activity but declining productivity.
San Juan Basin	(0.2)	<b>(0.3)</b>	Modest increase in drilling activity for conventional wells.
<b>Total U.S.</b>	<b>2.3</b>	<b>5.3</b>	High level of drilling activity for unconventional.

SOURCE: EPRI, *US Natural Gas Supply Equation and Price Envelope*, 2007. 1014146

# Canada Factors: Flat/Declining Supply, Increasing Demand, Lower Exports to U.S.

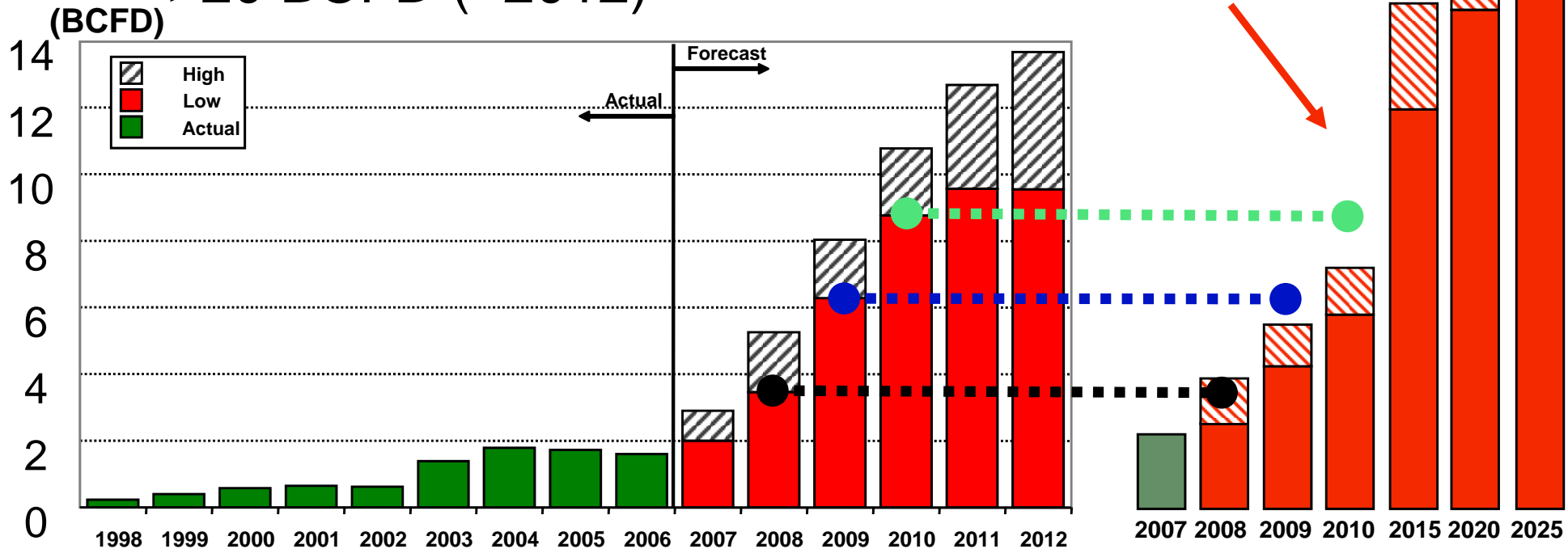


SOURCE: EPRI, *US Natural Gas Supply Equation and Price Envelope*, 2007. 1014146

Photo: M. O'Driscoll, Greenwire, 2005.

# Outlook for US LNG Imports\*

- U.S. LNG Imports Will Increase Dramatically
  - U.S. LNG imports now about 8 to 9 % of global market
  - Regas capacity will grow from 3.3 (2005) to >20 BCFD (~2012)



Source: EPRI, *Global Natural Gas Market Assessment*, 2008. 1014921.

Source: EVA, April 2008, personal communication.

\*incl. LNG to US via Mexico and Canada



# Key Factors Underpinning LNG Outlook

- Record additions to global liquefaction capacity
- Expansion of existing terminals and greenfield LNG terminals
- Importance of competing (i.e. non-LNG) sources of gas to many countries: Europe, China, India
- Reasonable access to uncommitted supplies

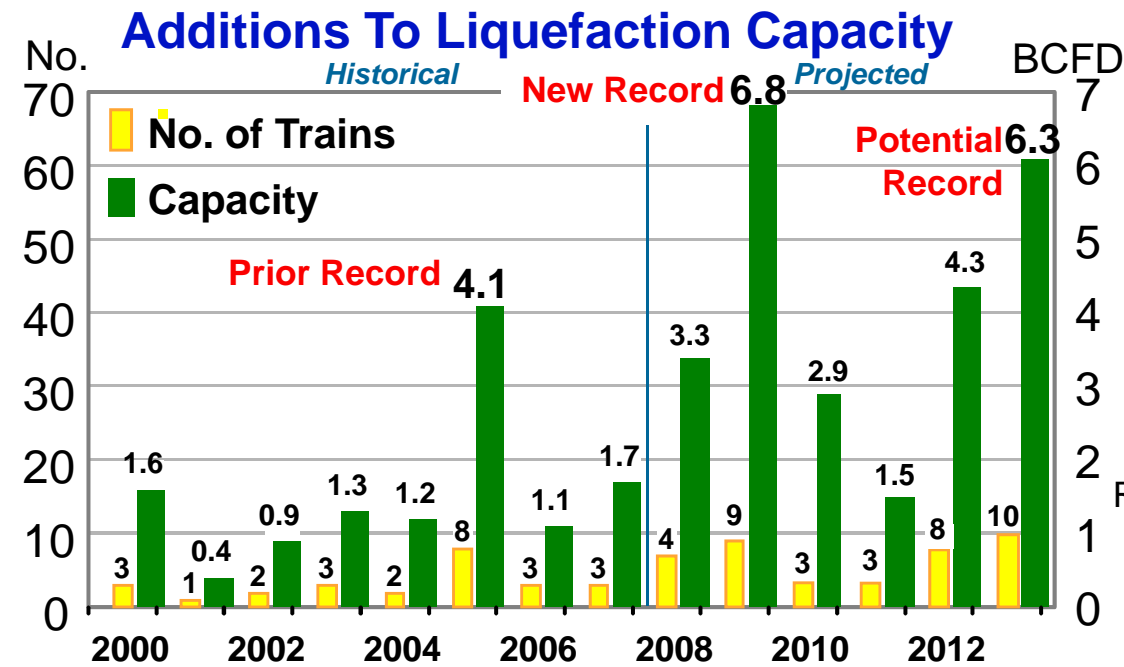
# Liquefaction

- Unprecedented boom
  - From 14 to 50 BCFD in 10 yrs
- Eng'g/const'n industries maxed out
- A “dynamic” process (estimates will change, basic message won't)



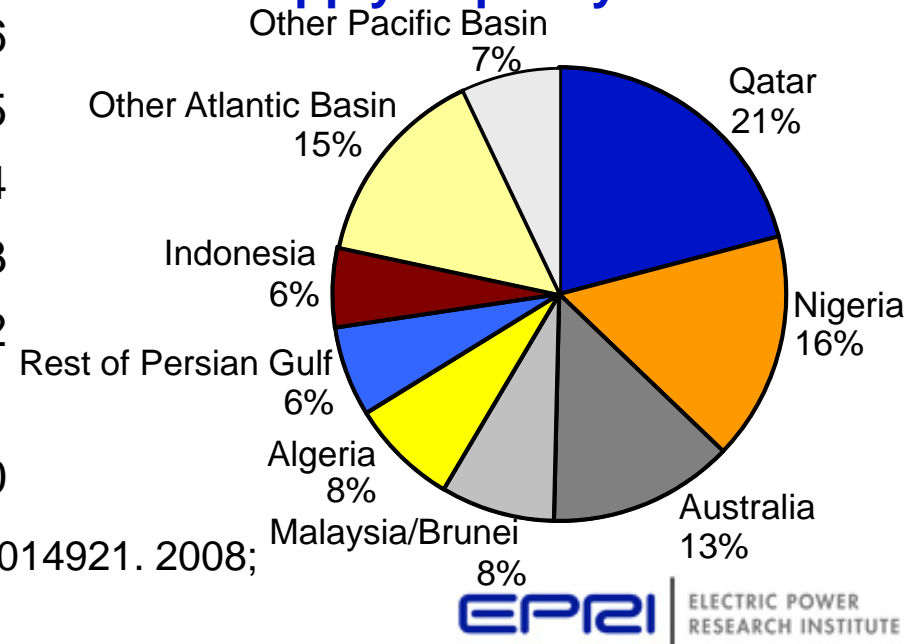
Niger Delta, Bonnie Island LNG terminal\*

\*"Curse of the Black Gold: Hope and Betrayal in the Niger Delta" National Geographic Magazine, February 2007. <http://ngm.nationalgeographic.com/ngm/0702/feature3/>



SOURCE: EPRI, *Global Natural Gas Market Assessment*, 1014921. 2008; Updated April 2008, EVA, personal communication.

### Major Supply Points by 2013 Total Supply Capacity = 50.4 BCFD



# LNG Supply Commitments – The Critical Matter of “Access”

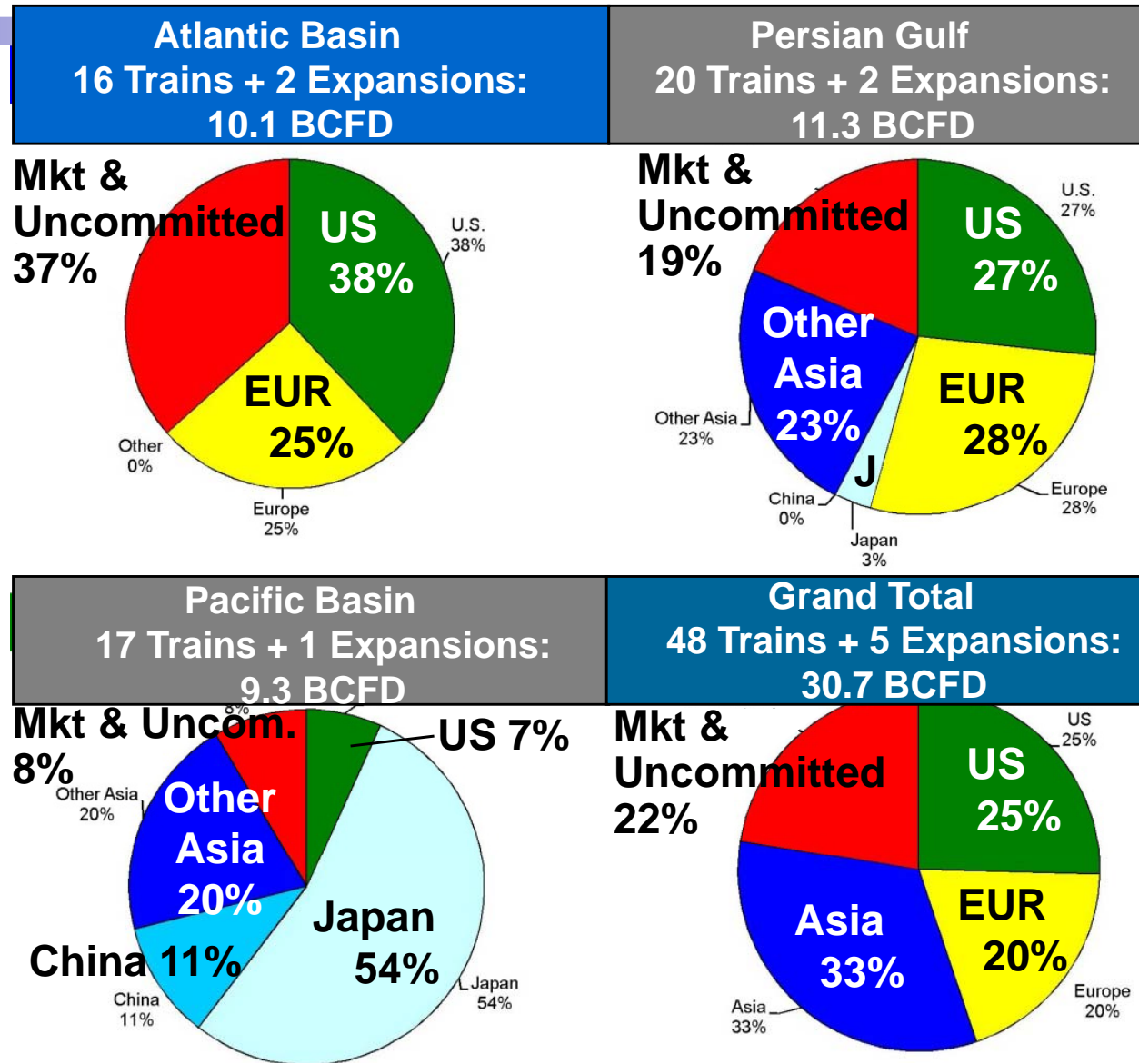
- Disposition of new projects only (2000-2012); older supplies deemed committed to “iron-clad” contracts of the earlier era.
- US to garner a fair share of marketing and uncommitted volumes.
- US moving toward longer-term contracts.

## Reference costs\*:

- New liq. train: \$2 B
- Upstream: \$20 B

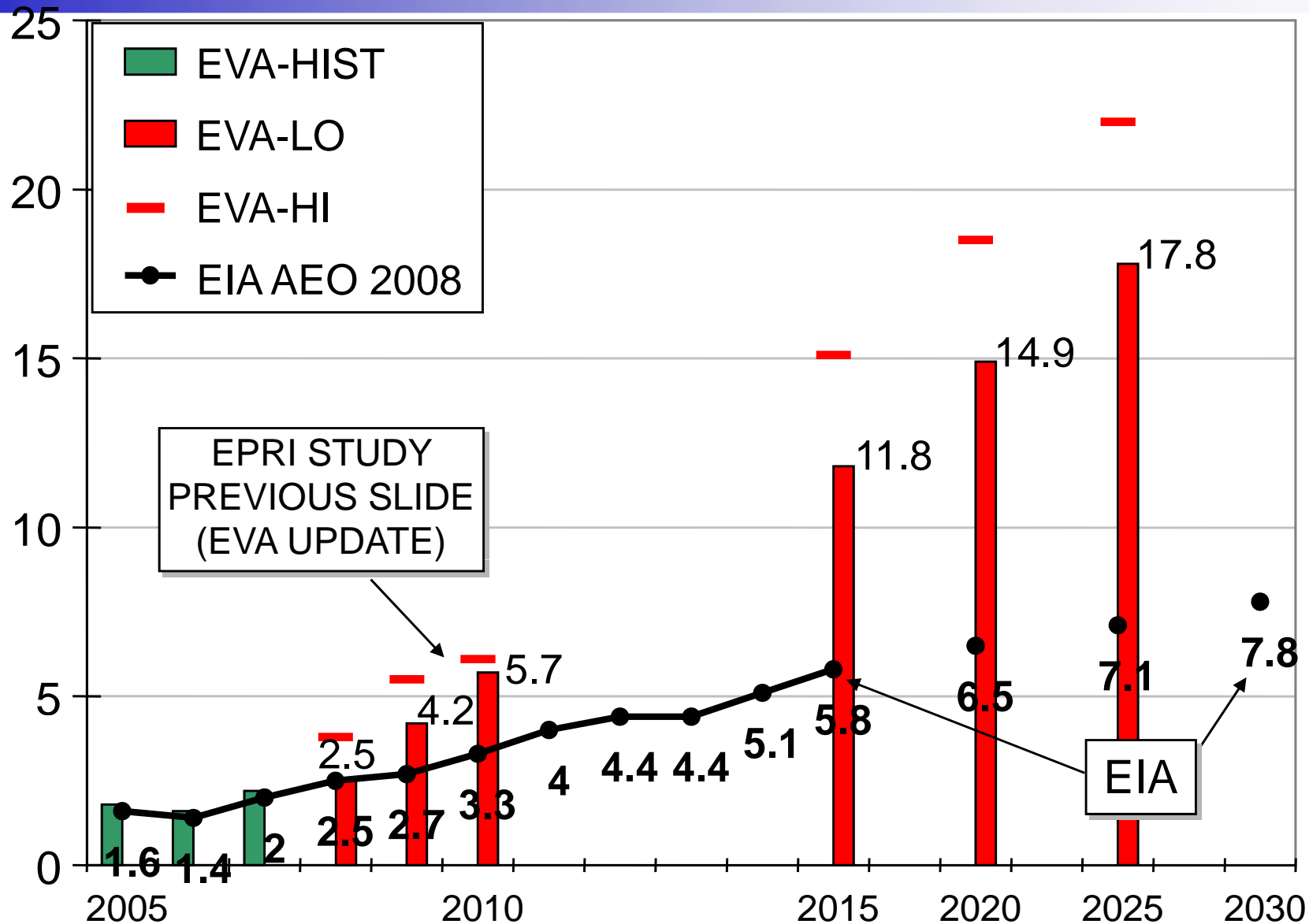
Uncommitted includes volumes not earmarked to a specific terminal but controlled by a marketing entity.

\*Global Insight's Jul-07 NG Monthly.



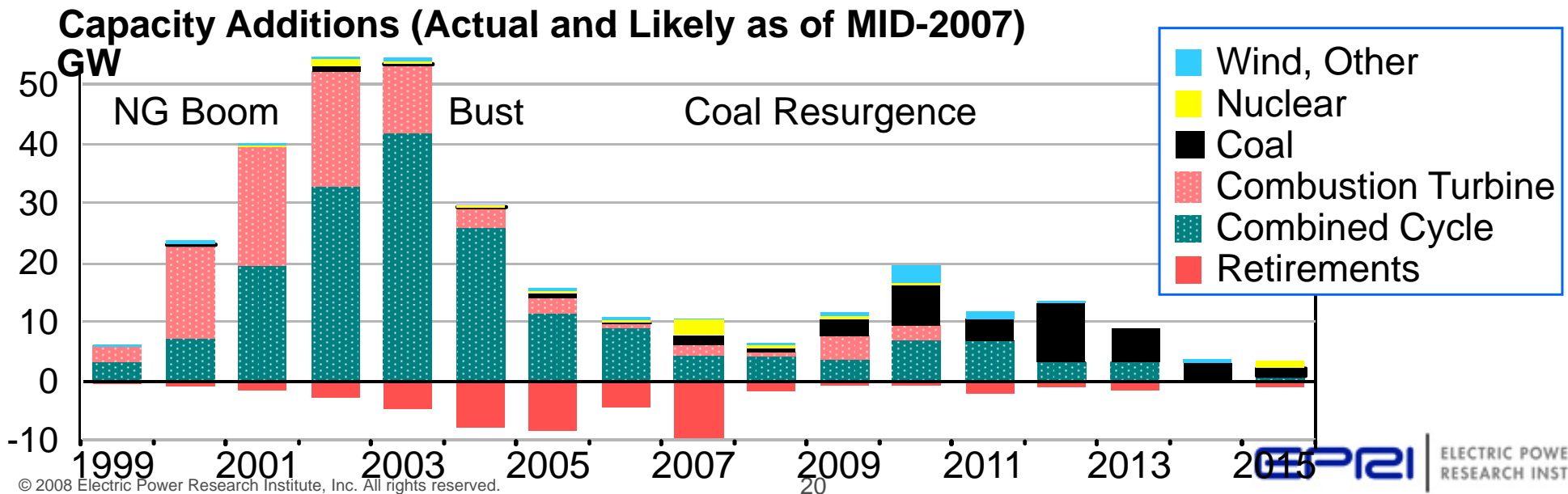
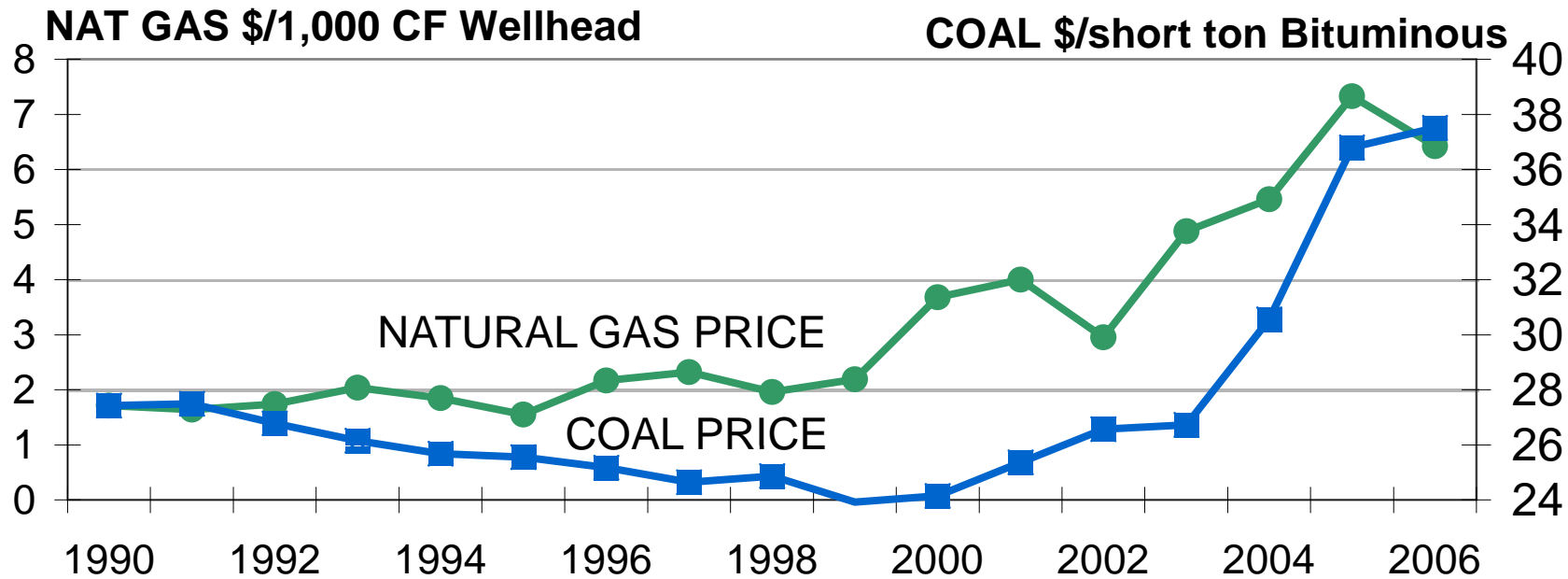
Source: EPRI, *Global Natural Gas Market Assessment*, 1014921. 2008

# Different Views of LNG Imports: EIA Annual Energy Outlook 2008 – Revised Early Release\*

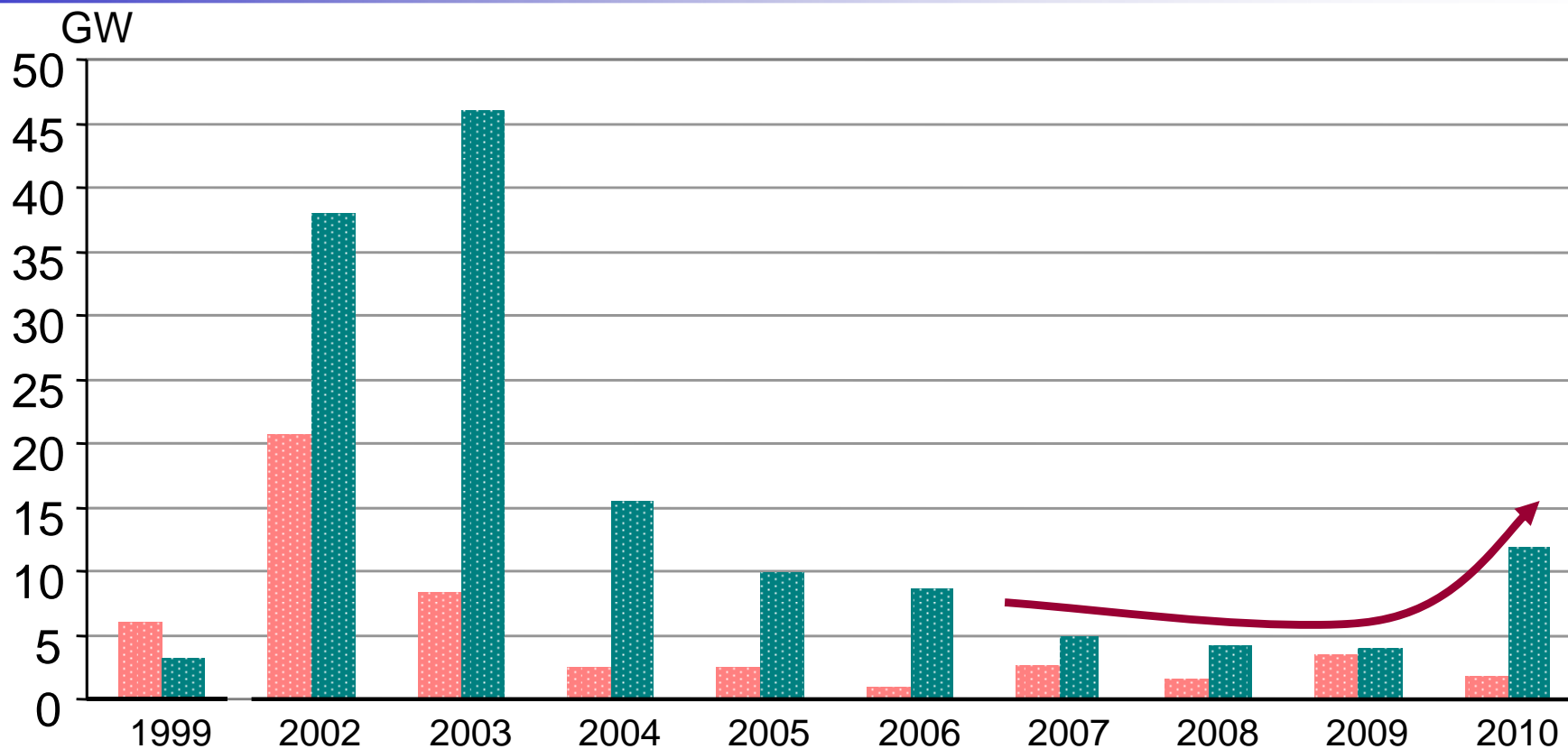


\*March 2008

# NG Demand: Choosing NG or Coal for Electric Generation



# NG Demand: Turning to NG in Spite of High Prices – A “Mini-Boom” by Default?



Peakers	6.0	20.7	8.4	2.5	2.4	0.9	2.5	1.7	3.8	1.9
CC Units	3.2	38.0	46.0	15.5	9.8	8.6	4.6	4.6	4.3	12.1

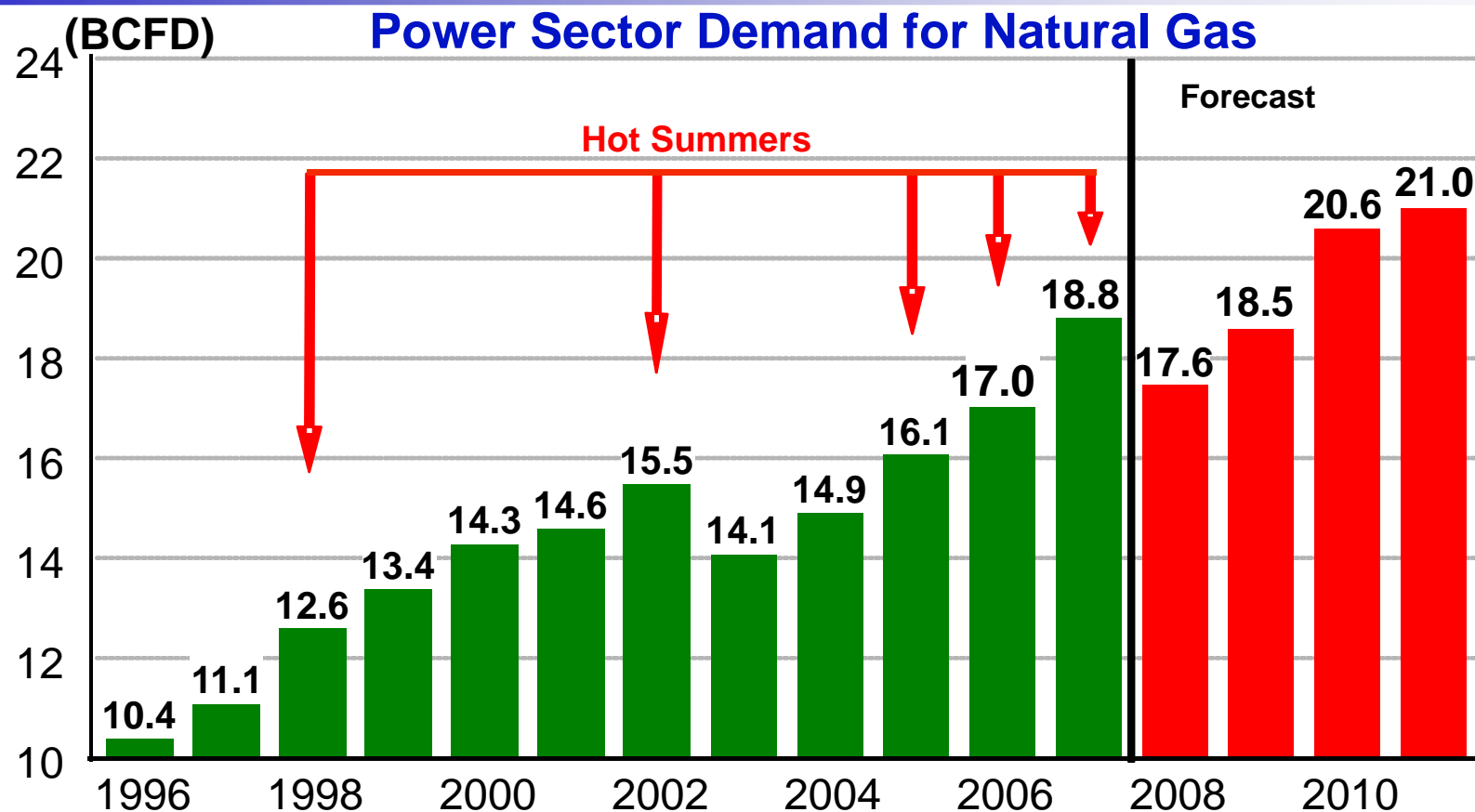
## Average New CC Capacity Utilization

47% ... 43% 32% 34% 34% 34%

SOURCE: EVA for EPRI, personal communication, Feb. 2008.

Forthcoming EPRI Program 67 newsletter on new power plants.

# NG Demand: Power Sector Growth Under “Business As Usual”



## Principal Reasons for Variation

- Electricity load growth
- Summer weather (esp. peak)

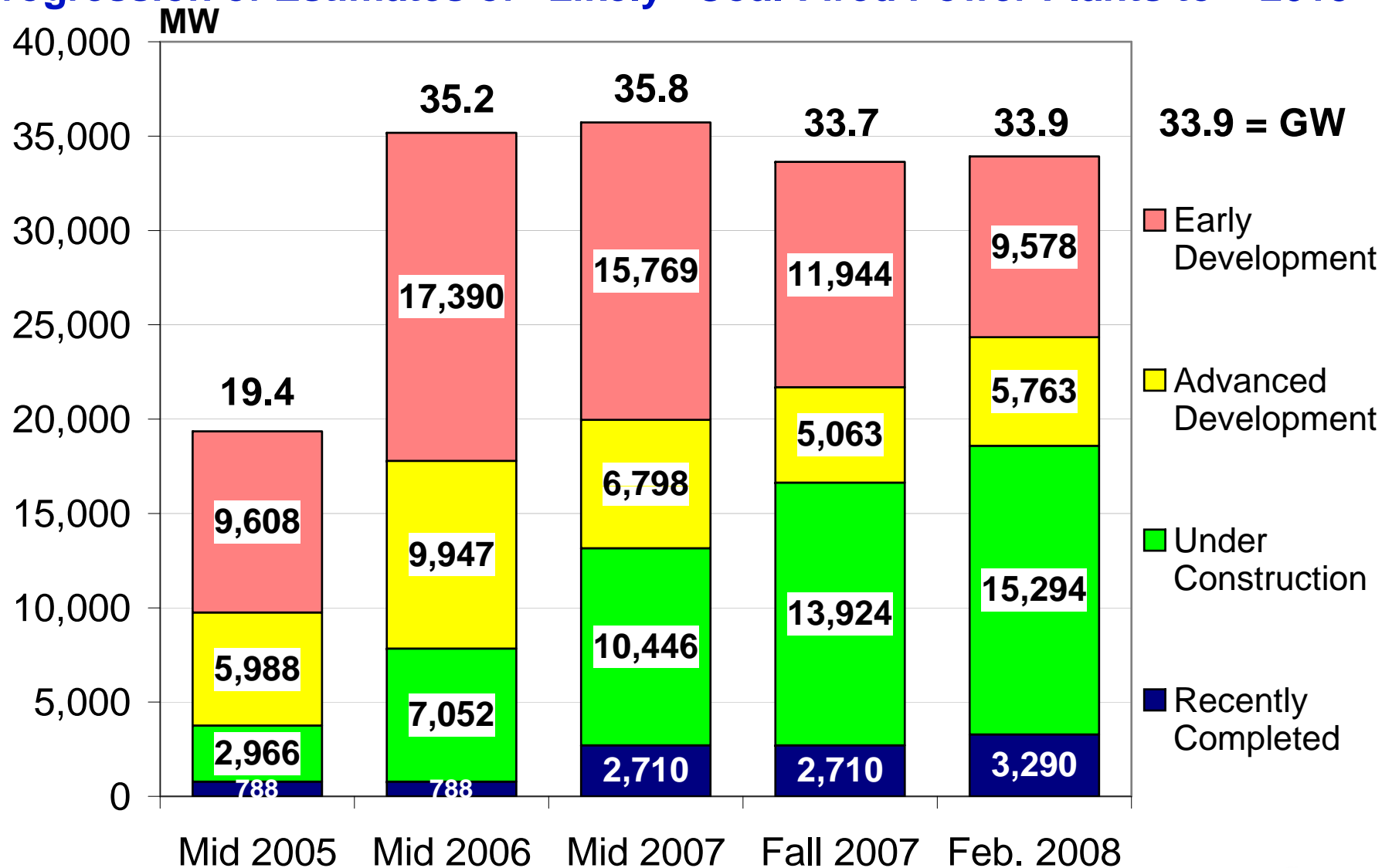
## Other Factors

- Fuel switching (not since 2005: oil prices >> NG)
- Hydro conditions

SOURCE: *US Natural Gas Supply Equation and Price Envelope*, 2007. 1014146  
(updated 4-08 EVA pers. commun.)

# US Tally of Coal Plants after 2007 Wave of Withdrawals, Cancellations, and Stalls

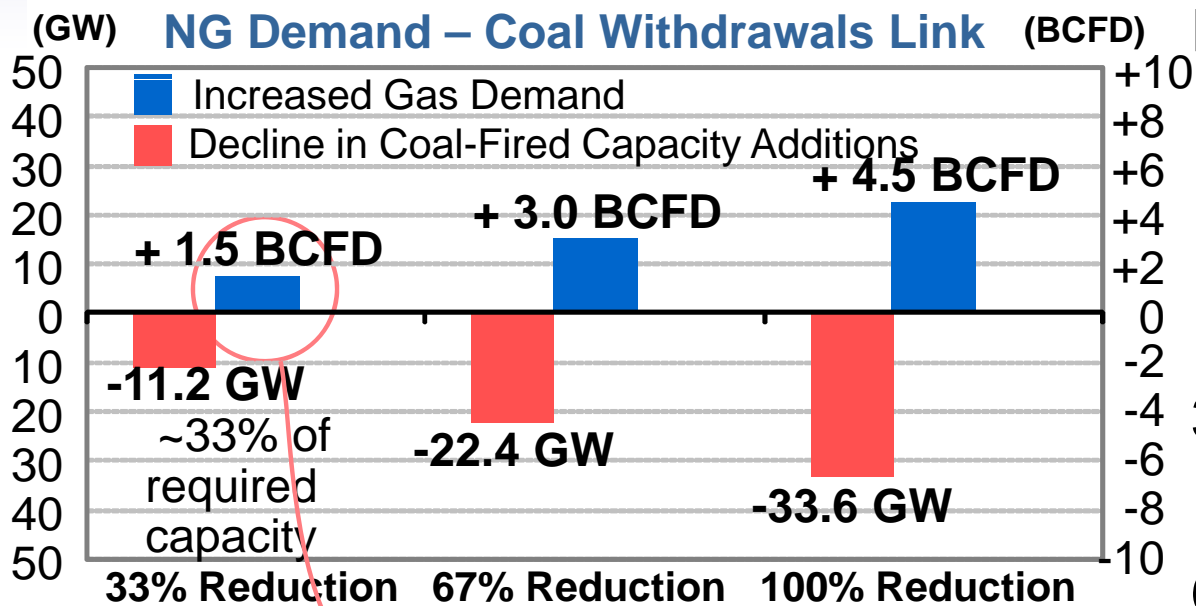
Progression of Estimates of “Likely” Coal-Fired Power Plants to ~ 2015



Source: EPRI P67 newsletters on p-plant announcements; Feb'08 EVA personal communication.



# Business NOT as Usual: Impacts of Coal Plant Withdrawals



## Focus to 2015

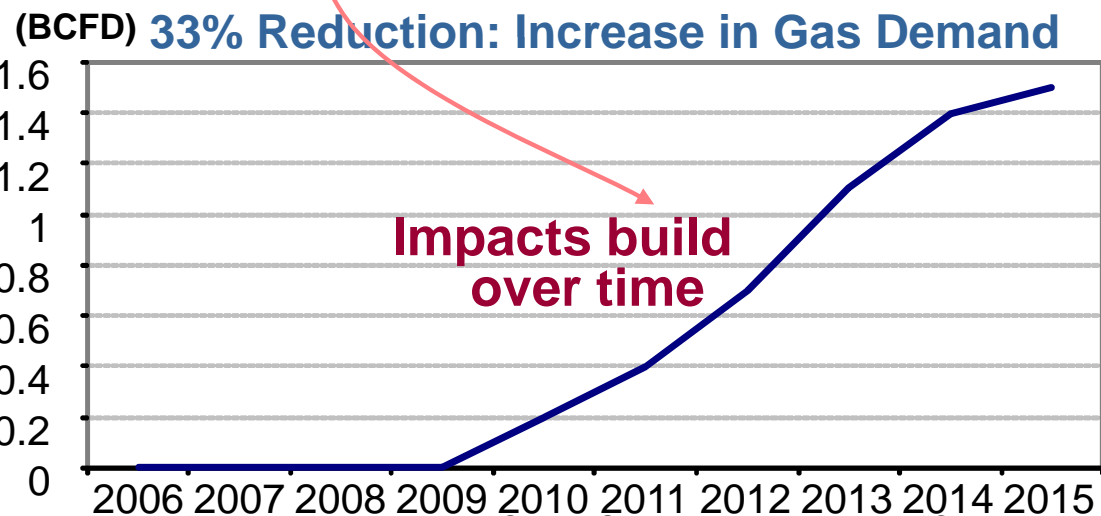
- No new nuclear; growth in renewables factored in.
- No realistic alternative to NG in the intermediate term

**33% reduction:** ~\$7.50/MMBTU with add'l LNG imports

**67% reduction:** ~8.50/MMBTU with LNG at max, relinking to oil, and some fuel switching

**100% reduction:** \$9.50-15.00++ with fuel switching at max

Many questions



Source: EPRI-EEI Annual Power & Fuel Supply Seminar, Nov. 14 2008: "Can the Natural Gas Industry Adapt to a Reduction in Coal-Fired Capacity Additions?", by EVA; EPRI P67 Oct. 2007 newsletter.

# Conclusions

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- Topsy-turvy price outlook
- What to watch?

# Foreseeable Swings in NG Price Regimes

*A Complicating Factor for Gen. Planning even in Normal Times*

**“Head  
Fake”**

S. Specker,  
NAS En. Summit  
March 14 2008

- Intermediate Term: Softening prices
  - Expanding storage
  - Strengthening production
  - Growing LNG (liquefaction, regasif.) and share of this world market
  - Major new pipeline unlocking Rockies nat. gas
- Longer Term: High prices, unstable conditions
  - Effects of coal plant cancellations on demand
  - Arctic pipelines critical to maintaining a balanced market
  - NG the default choice if there are any stumbles in the prism of responses to de-carbonize the electric sector

# What to Watch?

- Stringent CO<sub>2</sub> legislation: huge NG impacts
- LNG outlook – why so far apart?
- Coal plant withdrawals and power sector NG demand
- The march of unconventional production
- Arctic gas development – how much, when?
- Logic of linkage of oil-LNG and LNG-NG
- And more...



“2 Oil Firms Plan  
Alaska Pipeline”  
New York Times  
April 9, 2008

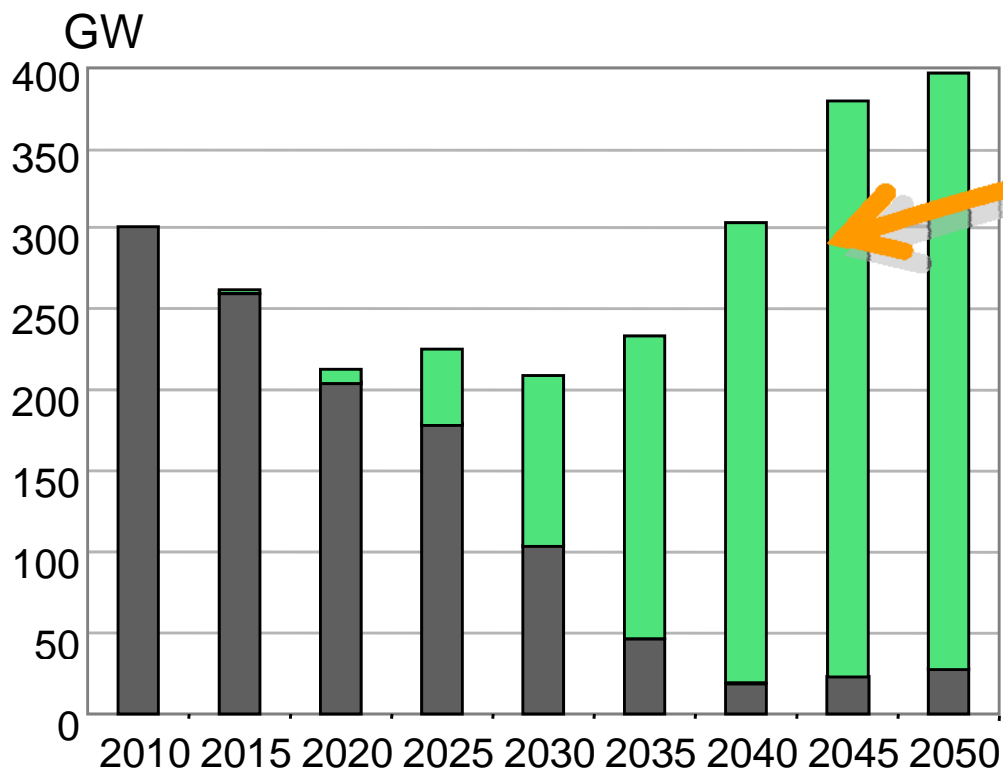
~4 BCFD in 10 years  
(or longer)

# CO2 STORY S2191– Charles River for Edison Electric Inst.

## Coal Retirements and NG Capacity Additions

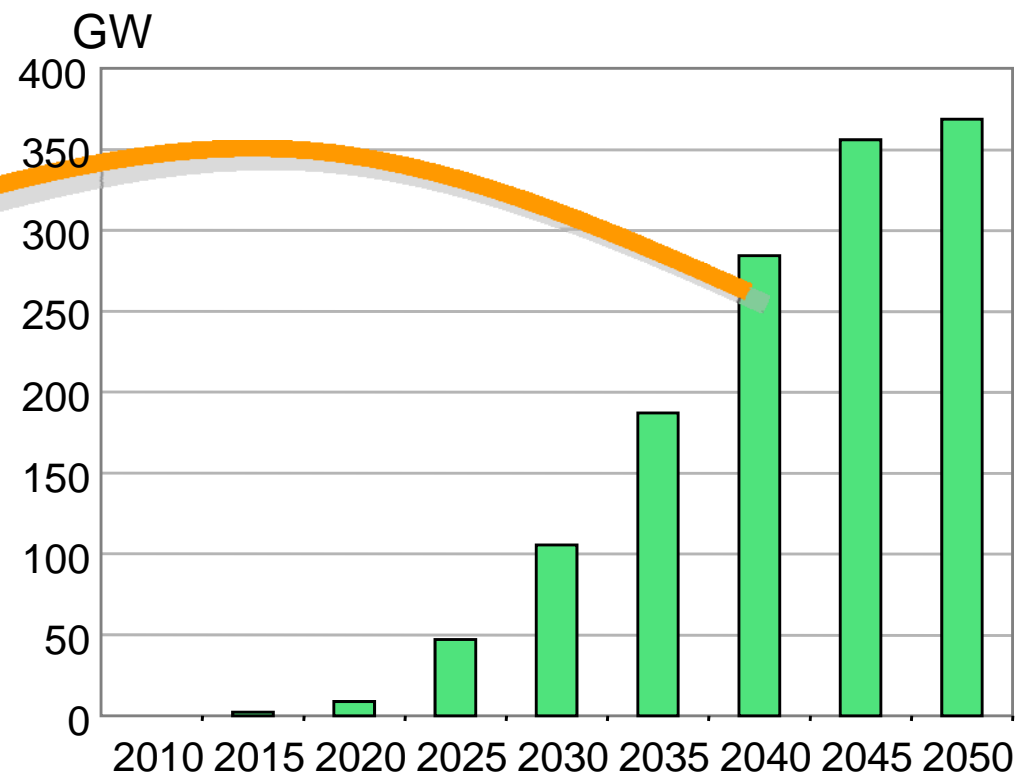
Existing Capacity Retires

Pulverized Coal Capacity On-Line



New Coal with CCS Comes Later

Advanced Coal with CCS Capacity On-Line

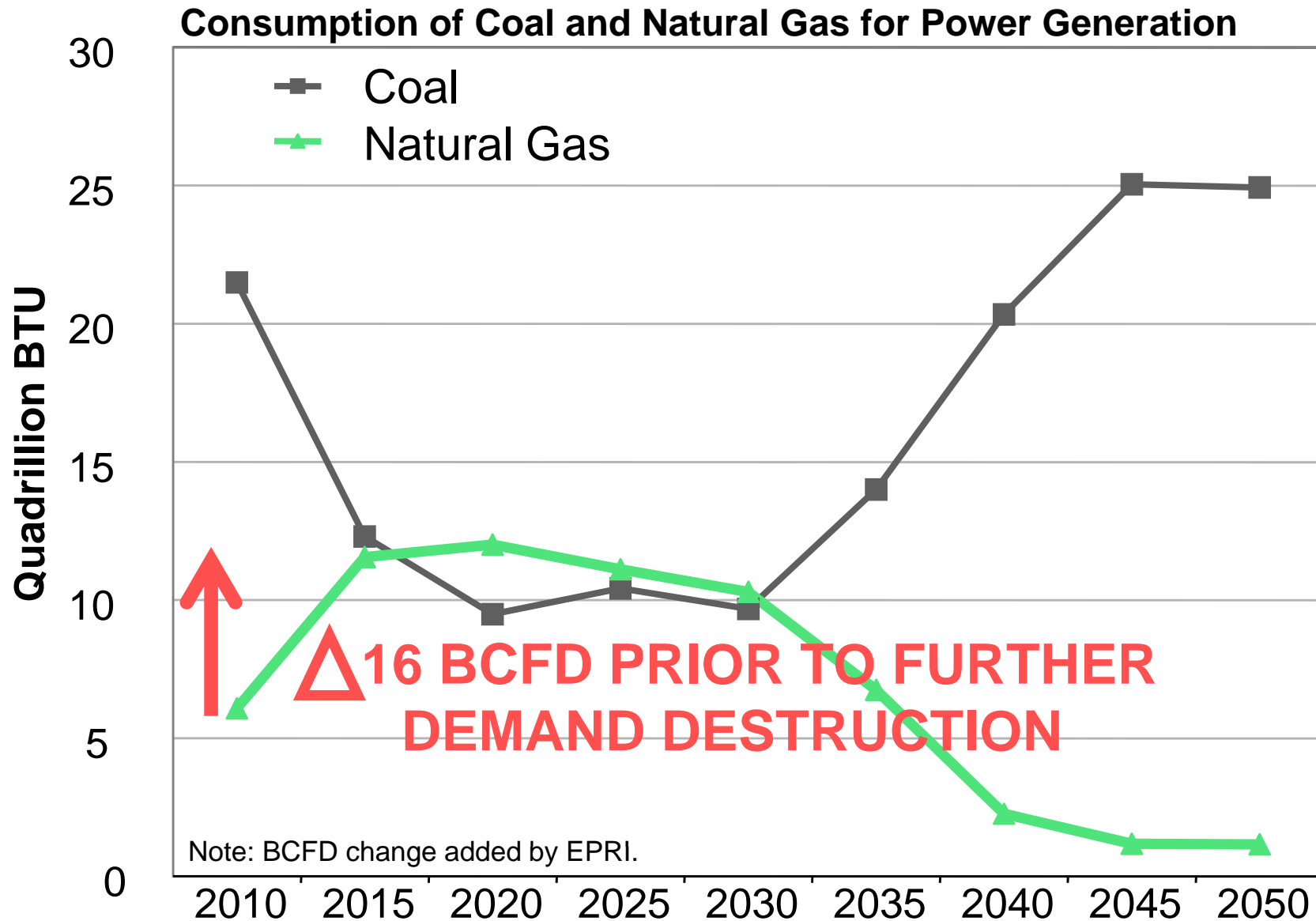


Source: CRAI for EEI, 1-31-08: Economic Modeling of the Lieberman Warner Bill.

Note: Superimposition added by EPRI.

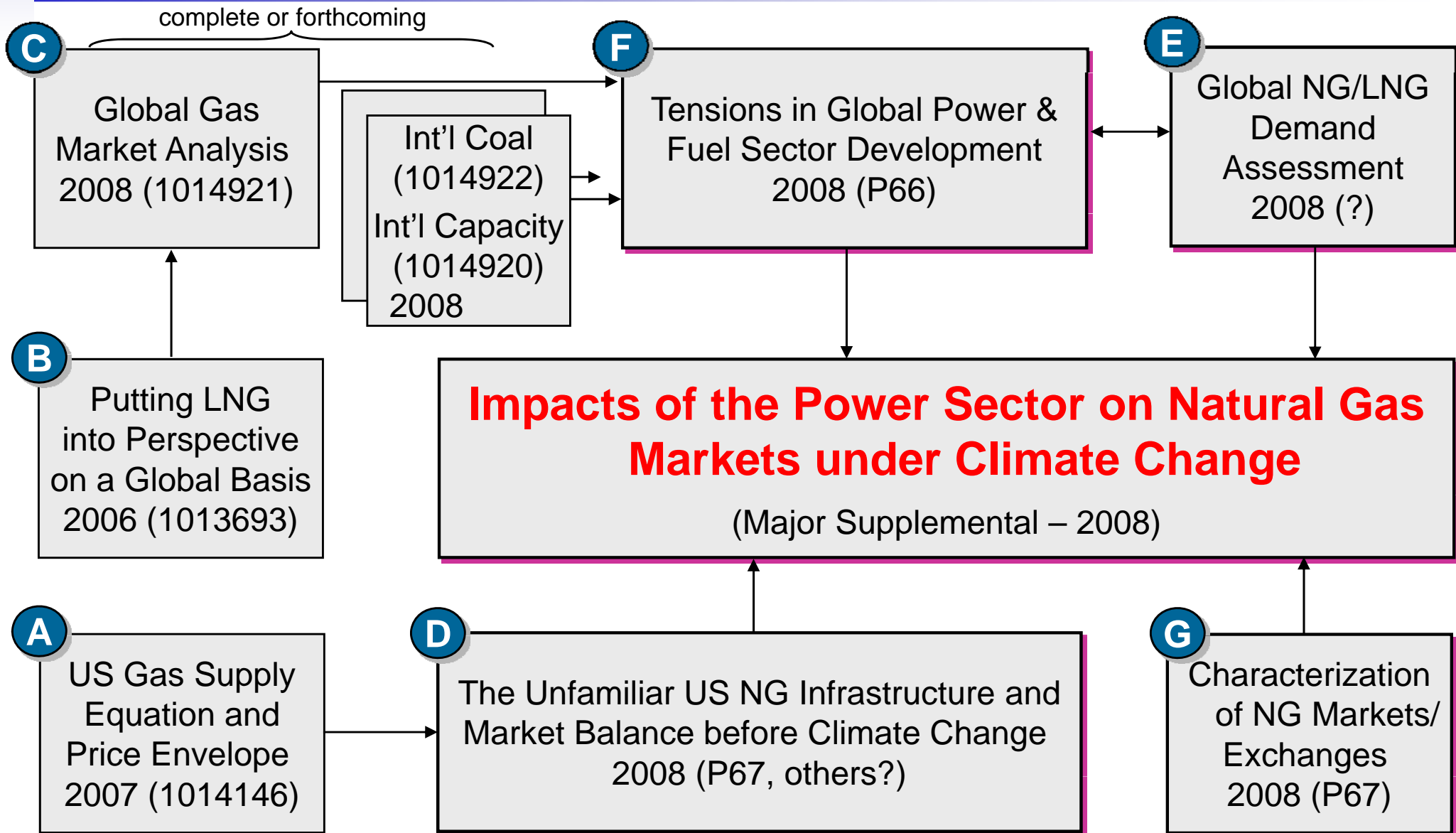
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# CO2 STORY S2191– Charles River for Edison Electric Inst. Gas and Coal Generation



Source: CRAI for EEI, 1-31-08: Economic Modeling of the Lieberman Warner Bill.

# EPRI Response: Framework of EPRI NG and Power Studies



# EPRI Response:

## Impacts of the Power Sector on Natural Gas Markets under Climate Change

### Nine steps – Broad company participation is sought

1. Requirements
2. Background – The US Market is Tight under Business As Usual
3. US Supply Choices, Responses, and Their Limits
4. US Demand Shifts Across Sectors
5. Global Supply-Demand Balance – Impacts of a Doubling\* of US LNG Requirements \*several growth levels will be examined
6. NG/LNG Pricing and Trading
7. Regional Infrastructure Development – How Big a Hurdle?
8. Contracting for Natural Gas Supply and Delivery
9. Conclusions



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- LNG outlook – why so far apart?
- Coal plant withdrawals and power sector NG demand
- The march of unconventional production
- Arctic gas development – how much, when?
- Logic of linkage of oil-LNG and LNG-NG
- E&P cost escalation
- And more...

