

## **Energy Market Dynamics Related Transportation Fuels**

- **Is EIA's (Energy Information Agency) Price Forecasting helping or hurting in providing Future Market Guidance ???**

**Why is EIA Price's Price Forecasting not working?**

- **Where will US Energy Market gets its supplies in the Future ?**

**William Piel**

**August 2005**

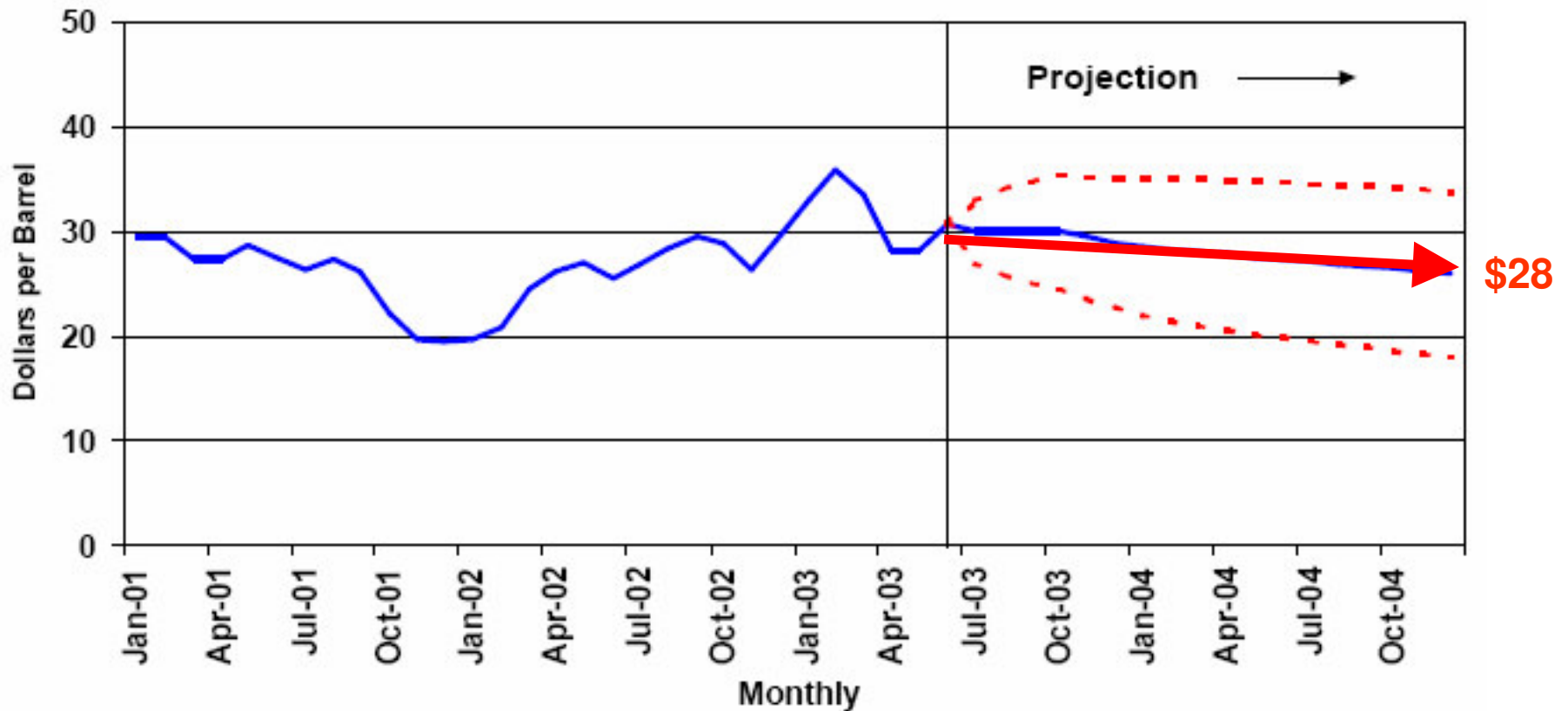
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**TEIR Associates, Inc**

**[www.teira.com](http://www.teira.com)**

July 2003

**Figure 1. WTI Crude Oil Price  
(Base Case and 95% Confidence Interval\*)**



*\*The confidence intervals show +/- 2 standard errors based on the properties of the model. The ranges do not include the effects of major supply disruptions.*

Sources: History: EIA; Projections: Short-Term Energy Outlook, July 2003.



July 2004

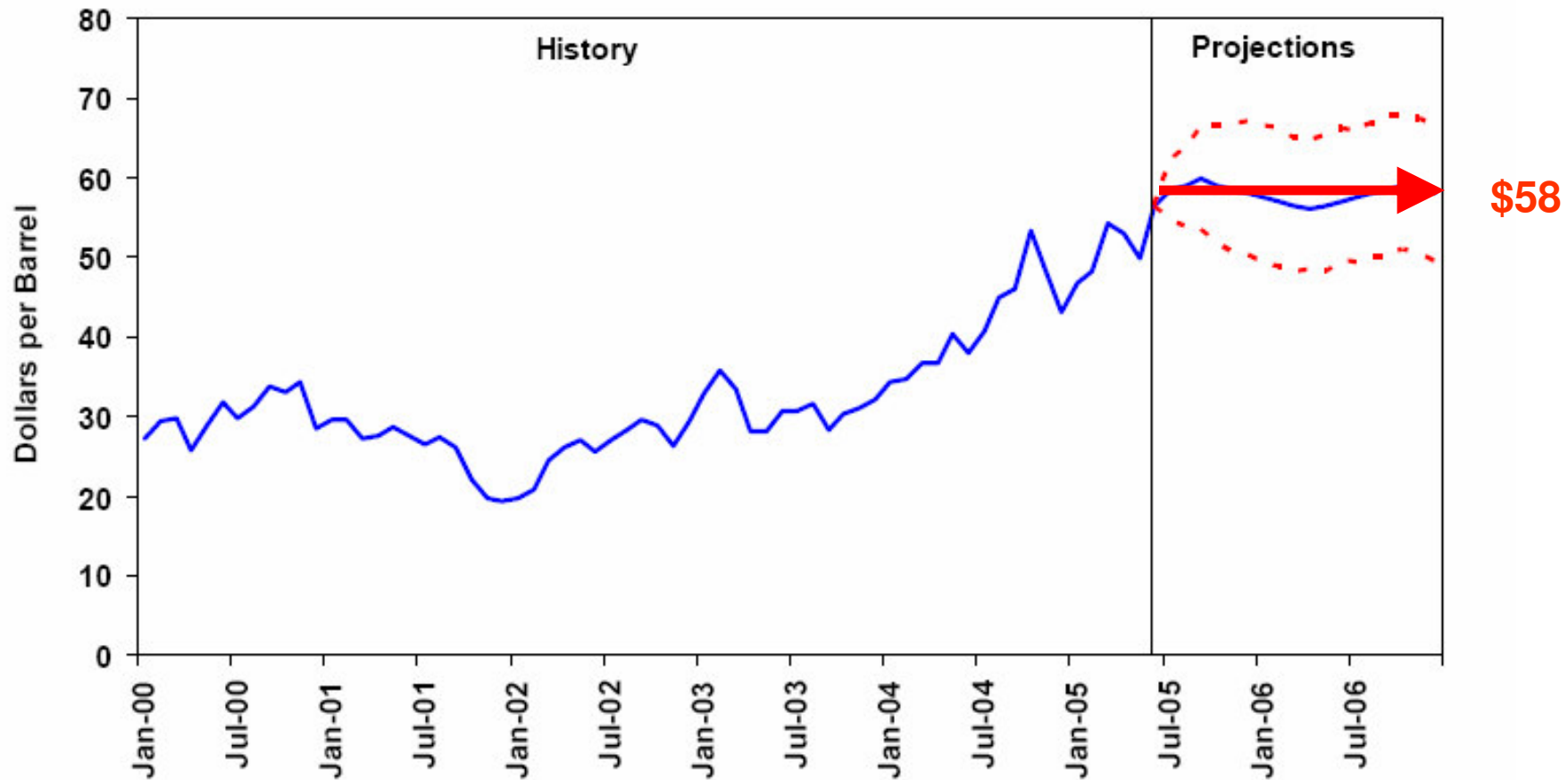
**Figure 1. West Texas Intermediate Crude Oil Price  
(Base Case and 95% Confidence Interval\*)**



\*The confidence intervals show +/- 2 standard errors based on the properties of the model. The ranges do not include the effects of major supply disruptions.

July 2005

**Figure 2. West Texas Intermediate Crude Oil Price  
(Base Case and 95% Confidence Interval\*)**

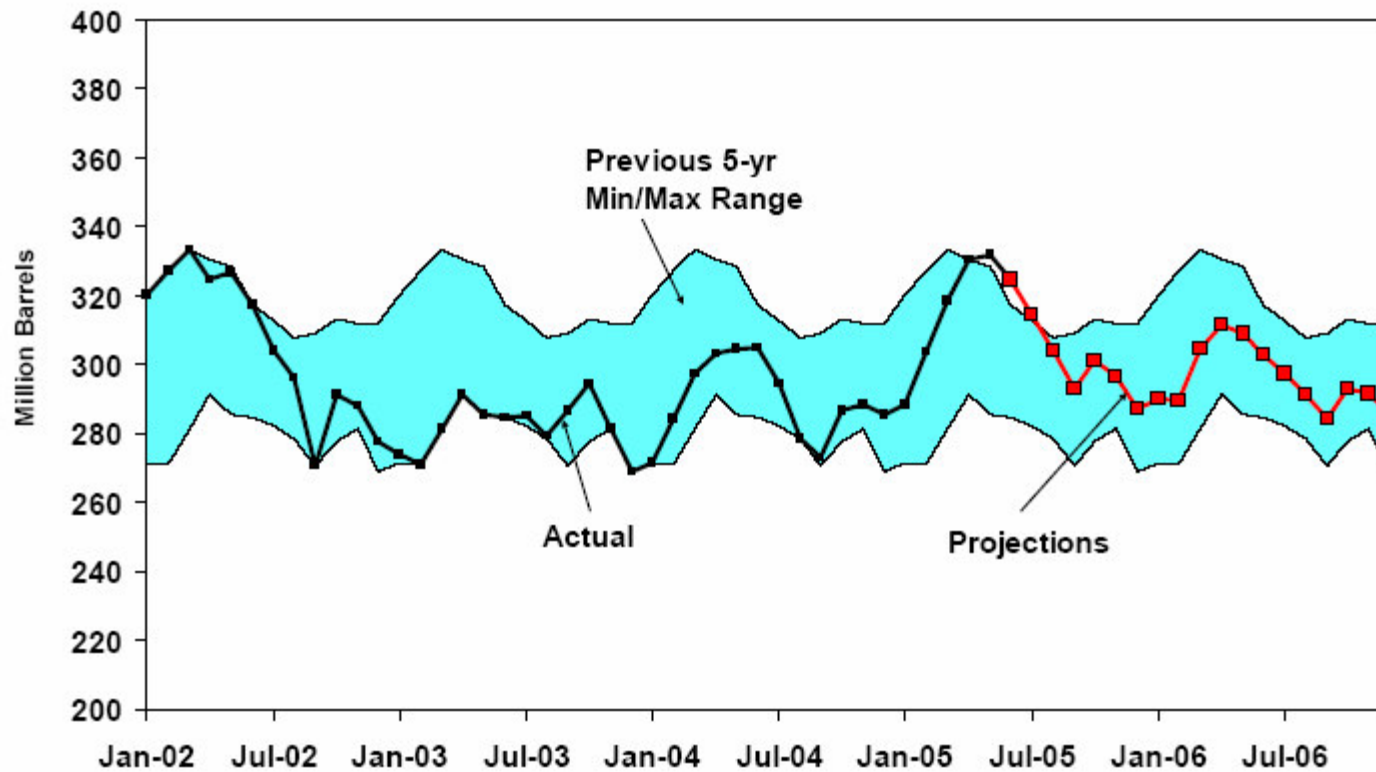


\*The confidence intervals show  $\pm 2$  standard errors based on the properties of the model. The ranges do not include the effects of major supply disruptions.



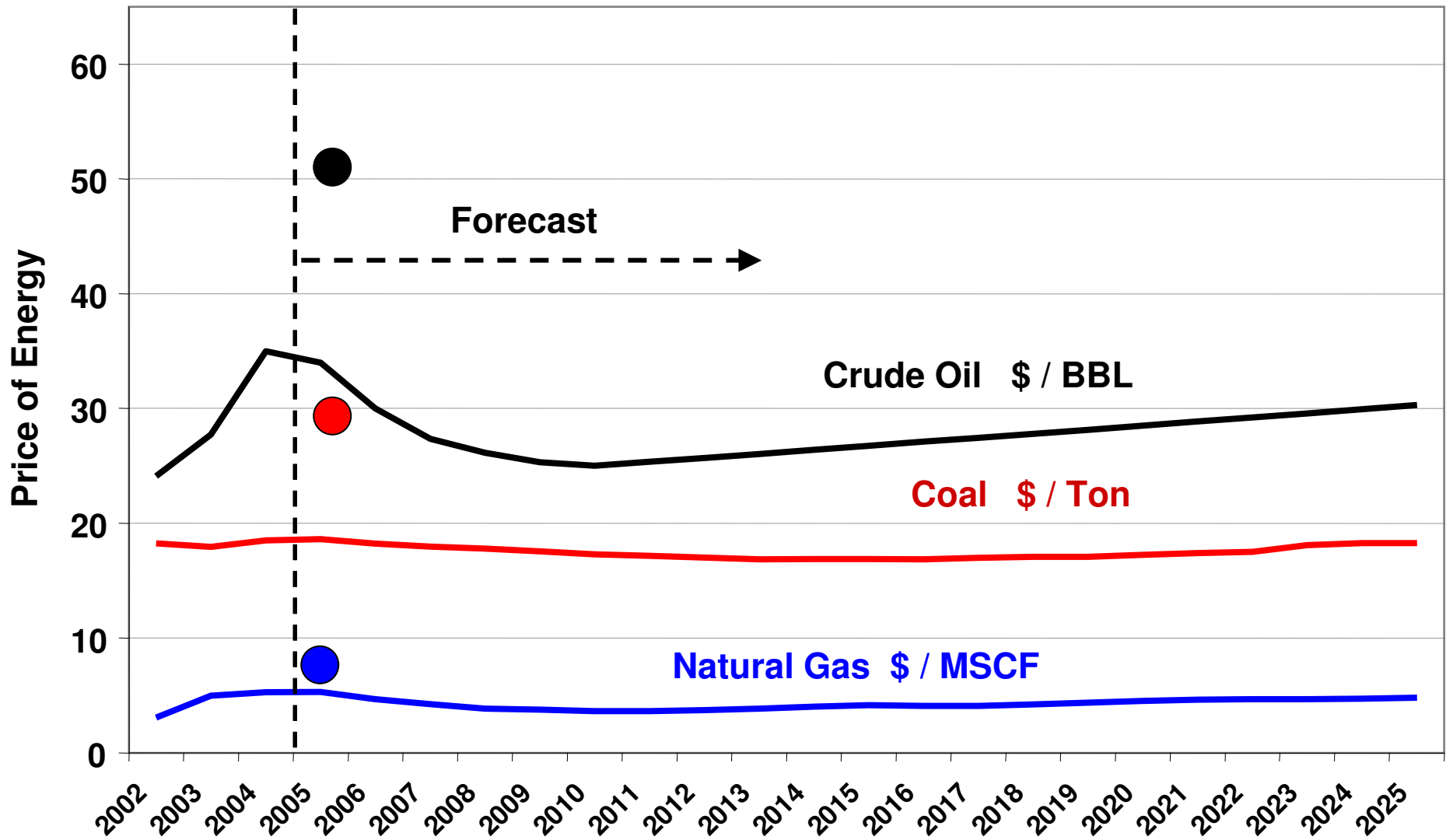
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Figure 7. U.S. Crude Oil Stocks



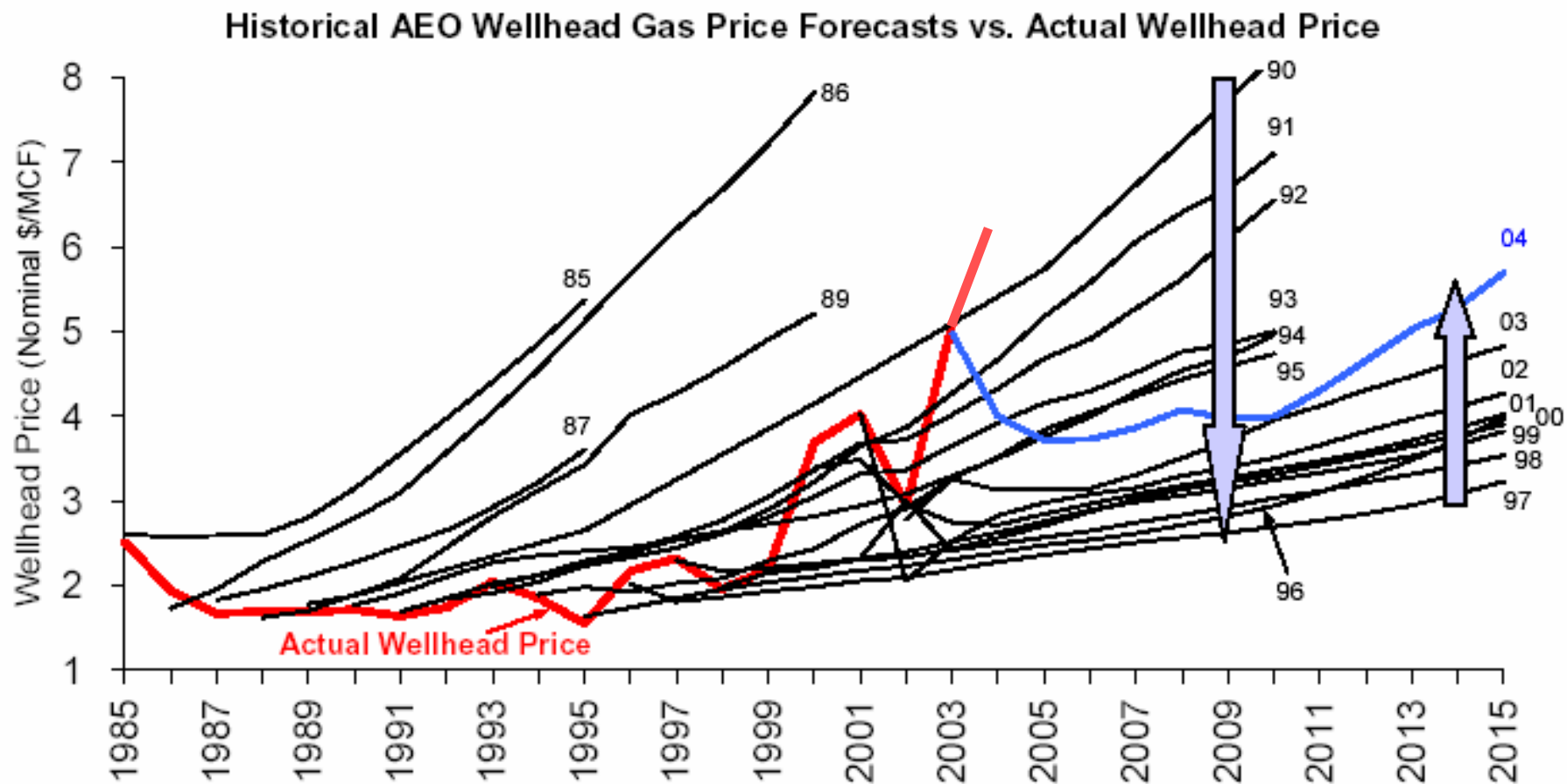
EIA's model implicitly assumes if "physical" inventory falls within five year historical range, then there is no "supply" pressure to change prices

# EIA Price Forecast for Raw Energy



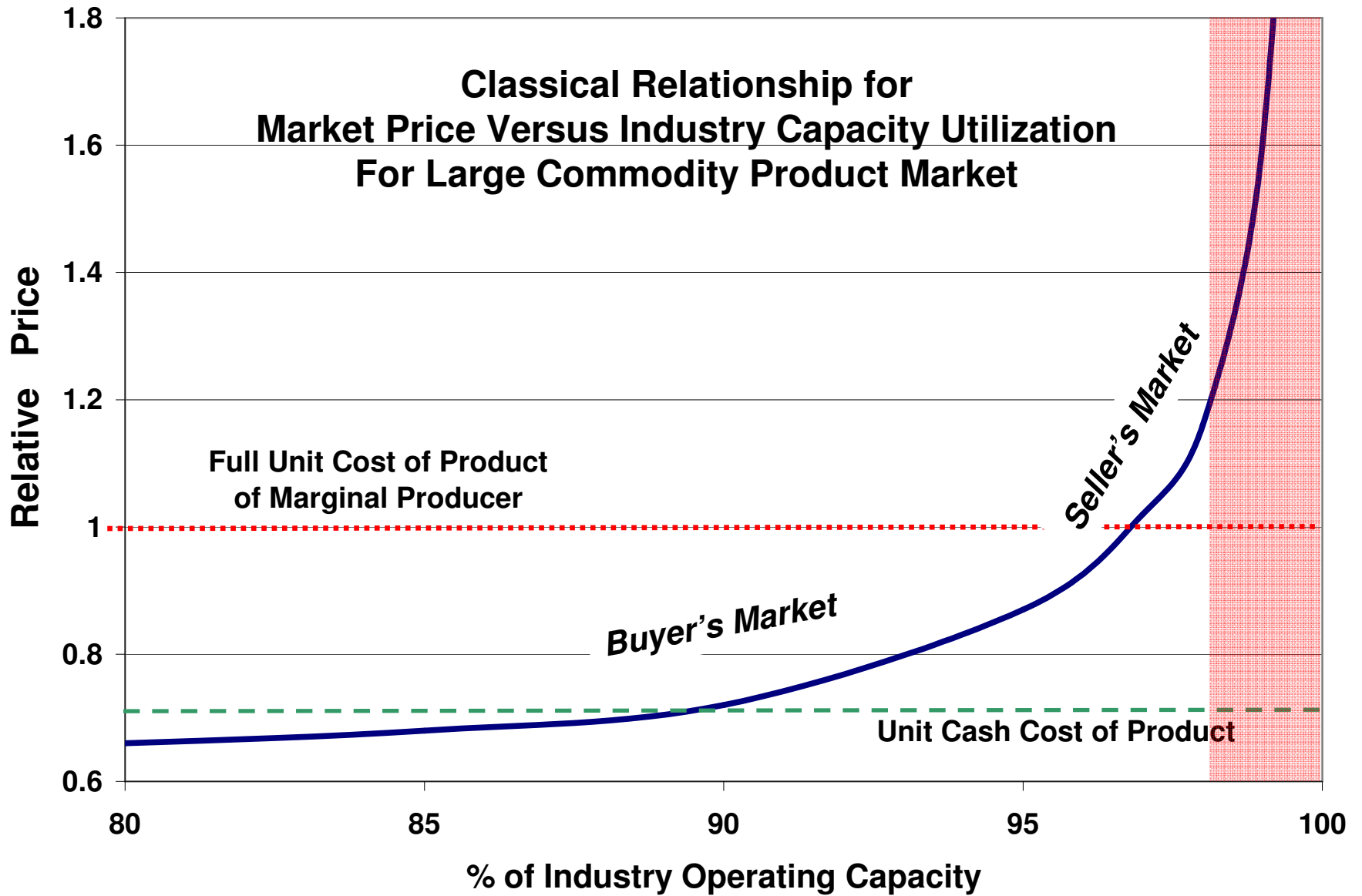
2005 Actual Prices are 30+% than EIA's December Forecast

## EIA Energy Price Projections Appear to Use Most Recent Past History



Source: EIA

Looking Backward to Project Forward Creates a Five Year Lag Factor

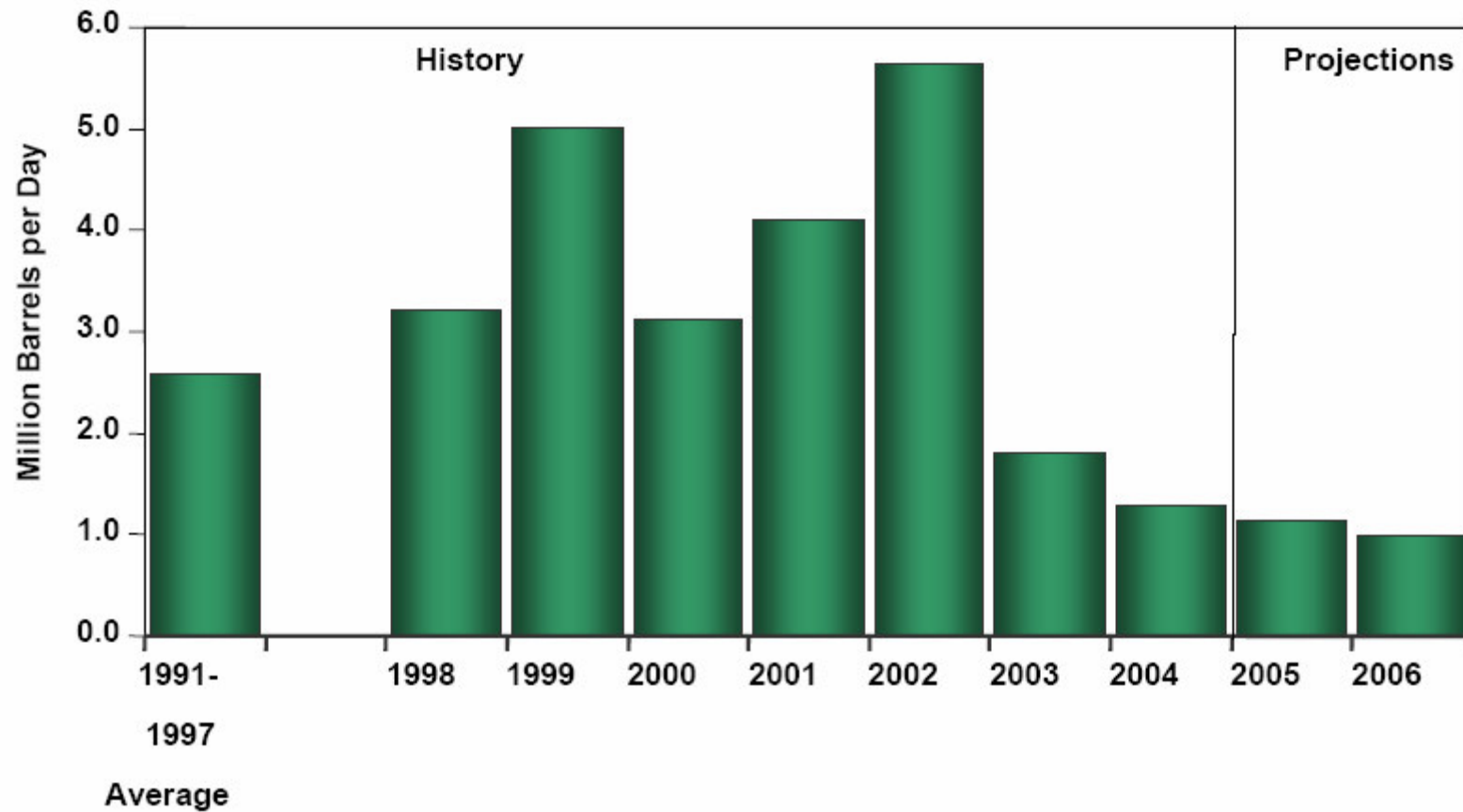


When spare capacity less than 2%, prices must increase to reduce demand



July 2005

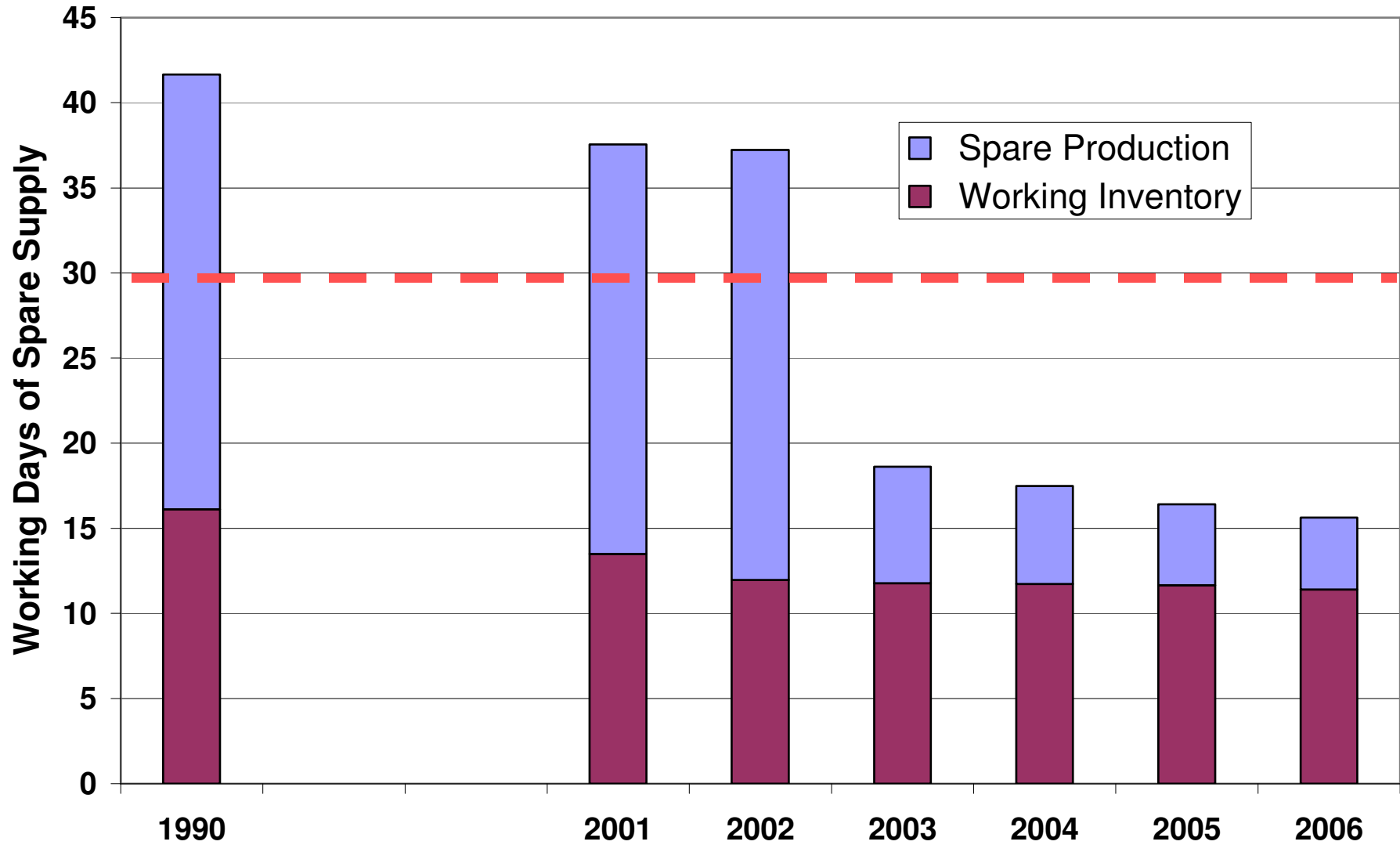
Figure 4. World Oil Spare Production Capacity



EIA finally began considering spare crude oil capacity in 2005

## Spare Crude Oil Supply

EIA needs to use “days of supply” by combining spare capacity and working inventory



Market price forces respond to “days” of spare supply and not inventory volume

## **Energy Market Dynamics Related Transportation Fuels**

- **Is EIA's (Energy Information Agency) Price Forecasting helping or hurting in providing Future Market Guidance ???**
  
- **Where will US Energy Market gets its supplies in the Future ?**

**Are there any energy options lower cost than H2 & Fuel Cell Vehicle ?**

# **Alternative Fuel Vehicle (AFV) History**

<b>1980</b>	<b>Alcohol Fuel Blends</b>
<b>Mid-1980's</b>	<b>LPG &amp; CNG Vehicles</b>
<b>1990</b>	<b>Neat Alcohol Vehicle (M85)</b>
<b>Mid- 1990's</b>	<b>Electric Battery Vehicle (ZEV's)</b>
<b>2000+</b>	<b>H2 FCV ?</b>

**Total Fuel Used for all AFV displaces less than 0.25% of the US gasoline**

August 2002

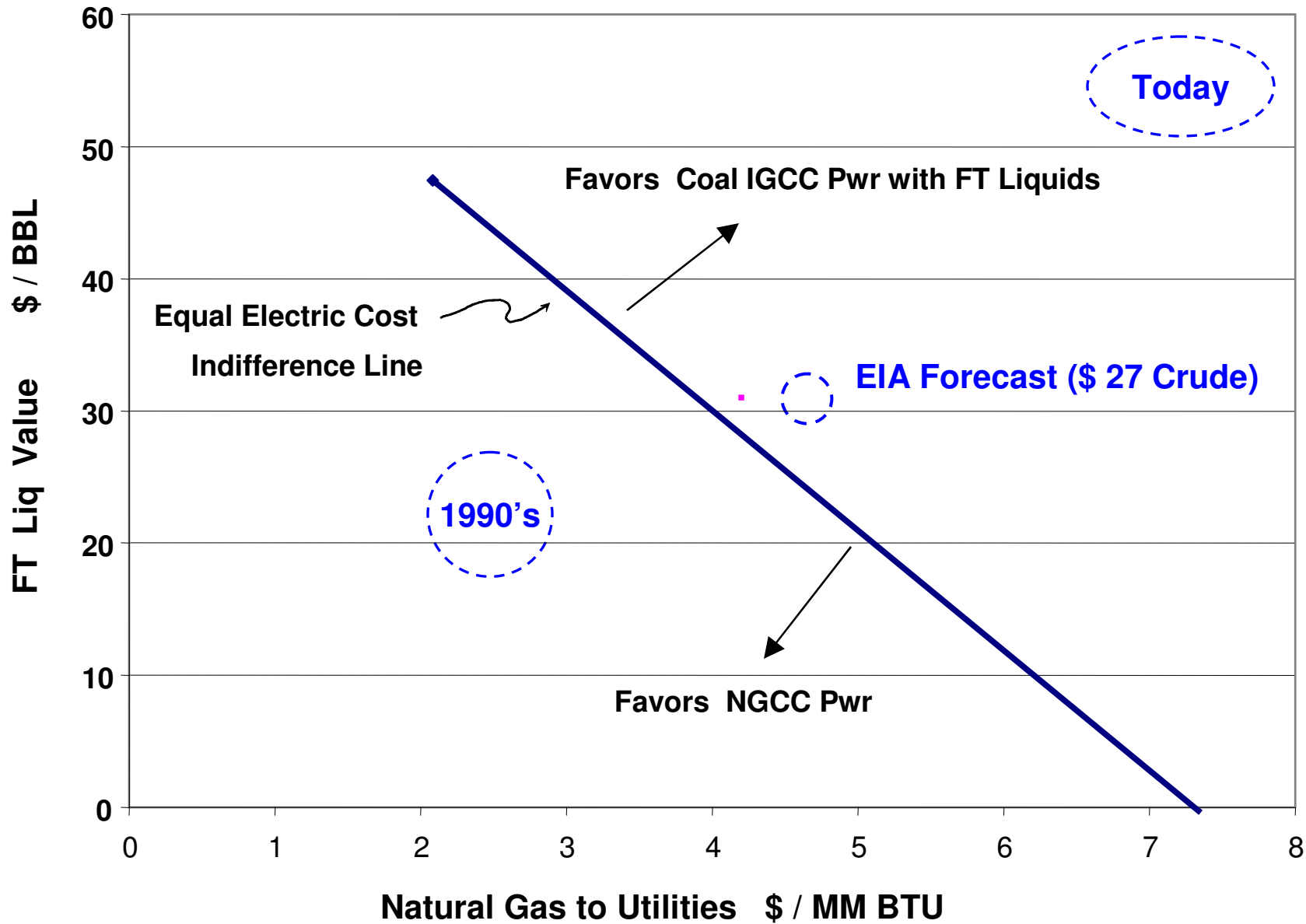
## Fuel of the Future ????

- **Transportation Fuel of the Future will be chosen by the Marketplace (or the Consumer); not by Government or Beliefs !**
- **“Free” Market will calculate value and costs on all fuel options based on information gathered and supplied by various fuel and technology developers, and then reward the economic winner, if any**
- **New Winner Criteria: A substitute or alternative must be lower cost than what it is trying to replace**

**Note: “Break-even” is not good enough**

August 2002

**Coal IGCC Pwr Co-Producing FT Liq Favored with Nat Gas > \$4 / MM BTU  
And Crude Oil > \$ 25**



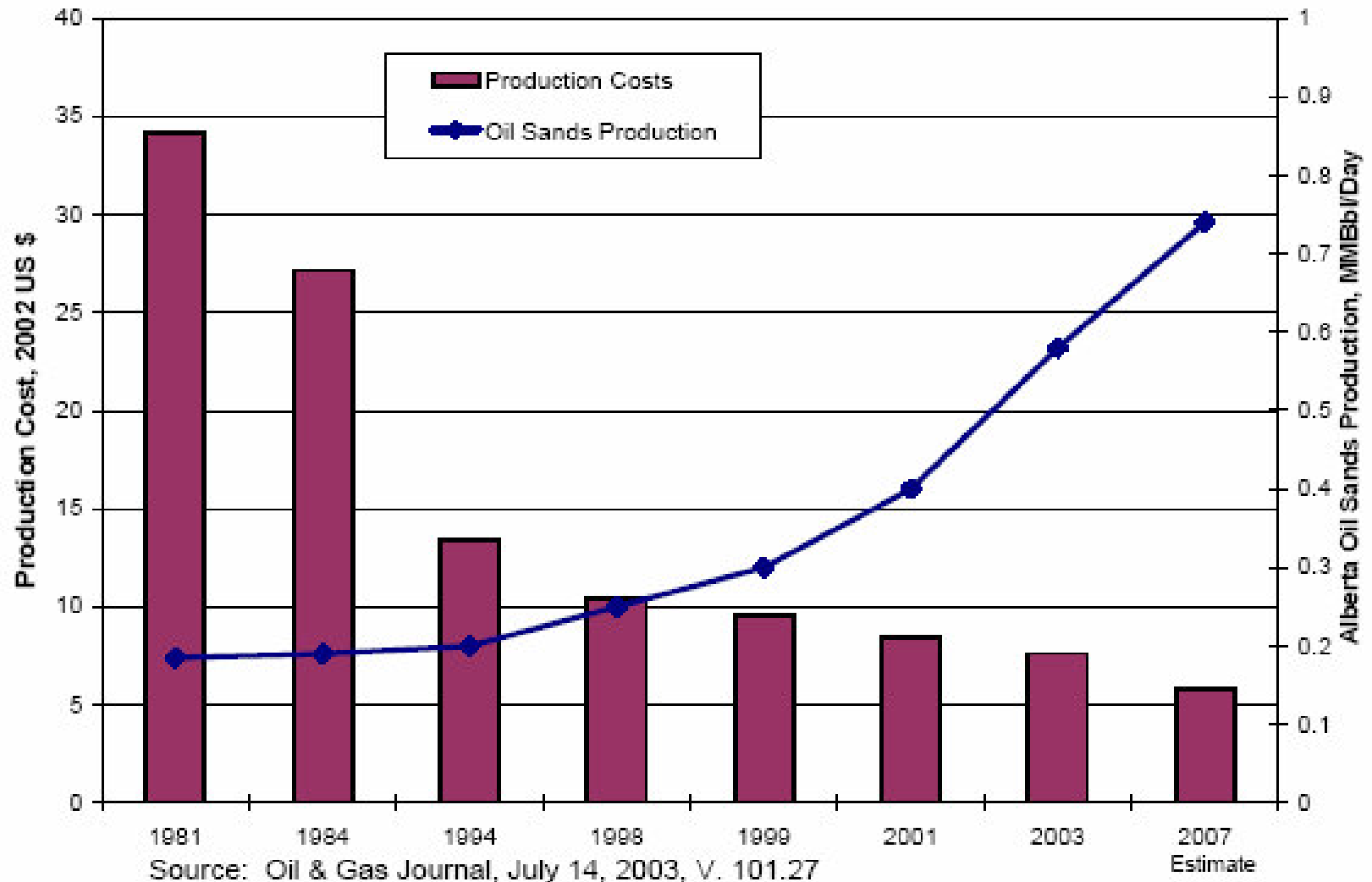
$FT\ Liq\ (\$/BBL) = WTI + 2 = Avg\ Imported\ Crude + 5.75$

10% ATROR & Coal @ \$ 1.22 MM BTU



*The Nation's First  
Strategic Petroleum Reserve*

# Tar Sand Economics and Production Continue to Improve



## What is the Cost of Displacing Crude Oil Use ? \*

Fuel Source	Vehicle Power Train	Crude Oil Displaced M BPD	GHG Decrease %	Cash Flow Change \$ MM / Day			Premium Over Crude Price \$ / BBL	Reduced GHG CO2 e \$ / mt
				WTT	Vehicle	Total		
Conventional (Crude)	Hybrid (15%)	37	16	-1.3	7.9	6.6	179	400
<b>Gas -</b>								
CNG	PISI	238	14	1.0	6.2	7.2	30	528
FT Diesel - NG	CIDI DPF	238	-14	2.3	0.0	2.3	<b>10</b>	<b>NA</b>
<b>Bio Fuel -</b>								
ETOH Sugar Beet	PISI	238	65	20.1	0.0	20.1	84	<b>305</b>
ETOH Wood Biomass	PISI	238	78	32.5	0.0	32.5	137	410
Bio Diesel Rape seed	CIDI DPF	238	38	16.4	0.0	16.4	69	429
<b>H2 -</b>								
H2 Thermal NG Reforming	FC	238	32	18.7	41.8	60.5	254	1840
H2 Thermal Coal Gas	FC	238	-19	16.8	41.8	58.5	246	<b>NA</b>
H2 Elect Wind	FC	238	95	39.8	41.8	81.5	343	850
H2 Elect Nuclear	FC	238	95	50.6	41.8	92.4	388	963

**H2 FCV break-even cost is \$ 300 to \$ 400 per barrel crude oil**

\* Extracted from Concawe / EUCAR WTW Analysis of Future Automotive Fuels and Power-trains in the European Context, January 2004 ( for 5% Fleet Replacement )



## North America Energy Supply Potential Billion of Barrels

	Total Resources Estimate -----	Recoverable Reserves -----	Recovery Cost \$ / BBL -----
Oil		50	5 - 15
Tar Sands	2,000	350	10 - 25
Coal FTL	1,000	500	15 - 30
<b>Shale Oil</b>	2,400	<b>1,000</b>	<b>25 - 45</b>
<b>Total N. America</b>		----- 1,900	
<b>Saudi Arabia</b>		260	5
<b>Iraq</b>		110	5
<b>Iran</b>		90	5
		----- 460	

### Consumption -

N. Am. Oil = 23 Million BBL / Day = 8.4 Billion BBLs / Yr

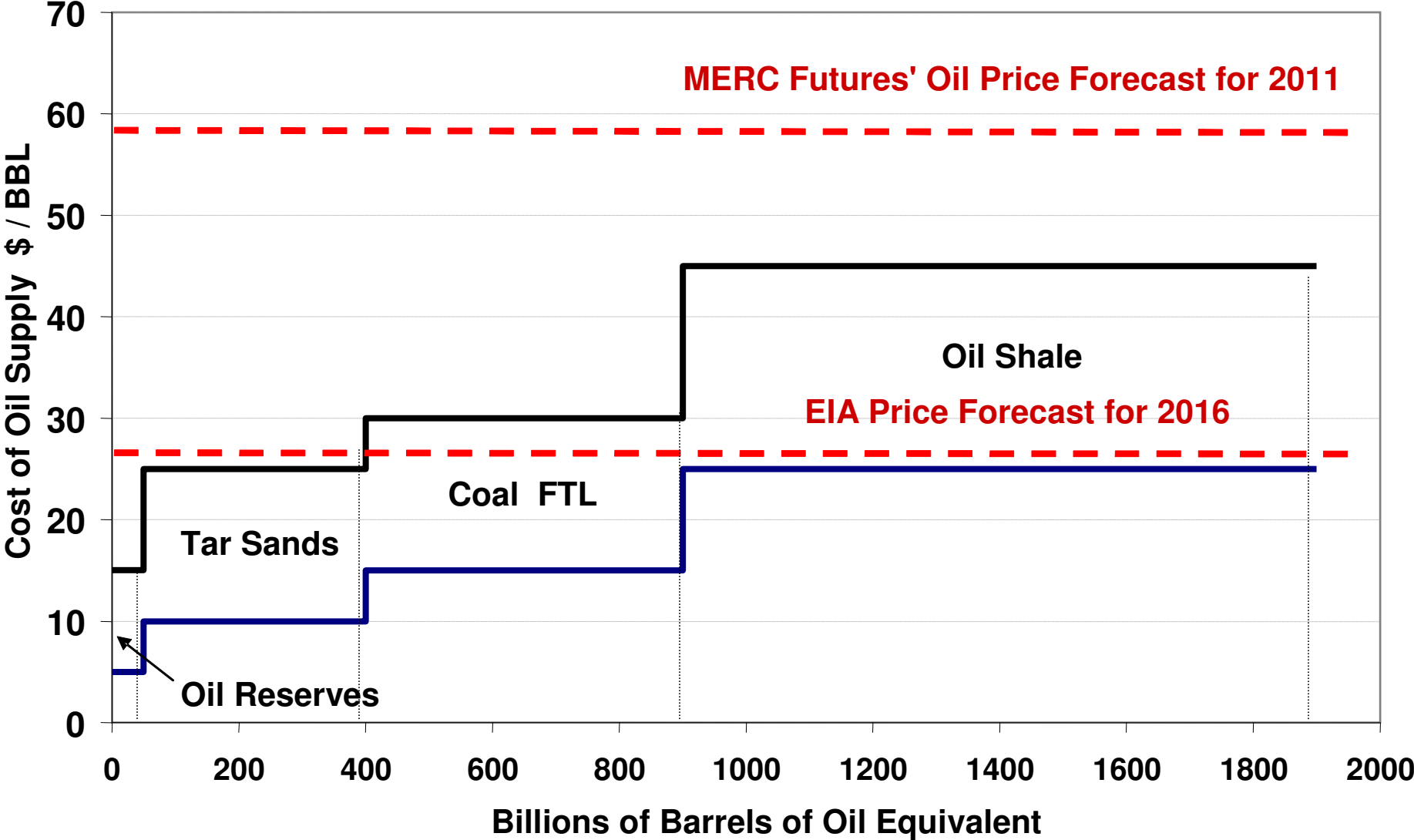
Potential Reserve Production @ R/P = 50

N. America Oil Equivalents Production = 38 Billion BBLs / Yr

104 Million BBLs / Day

# North America Oil Supply Potential

H2 FCV \$ 300+ / BBL



## **Energy Market Dynamics Related Transportation Fuels**

- **Is EIA's (Energy Information Agency) Price Forecasting helping or hurting in providing Future Market Guidance ???**

**EIA Price forecasts giving very wrong price signals to marketplace**

- **Where will US Energy Market gets its supplies in the Future ?**

**North America has largest energy deposits in world ( 200+ yrs )**

**Can be an energy "exporter" if prices stay above \$ 45 per barrel**

**Energy products will be HC liquids and not H2 !**