



ICAO AND THE WORLD BANK DEVELOPMENT FORUM

Maximizing Civil Aviation's Contribution to Global Development

Oil Price Spike: Result of Speculation or of Overall Concern about future supply?

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The World Bank

**Kuala Lumpur Convention Centre, Malaysia
14 and 15 October 2008**



Speculation or Supply Problem

The Oil Price Spike of 2008

- ❖ All time high of US\$ 147 per barrel in July 2008:
 - ➔ Speculation?
 - ➔ Problem of Supply?
- ❖ The airline industry is expecting major losses:
 - ➔ US\$ 2.3 to 6.1 billion in 2008
 - ➔ Several bankruptcies
- ❖ Crude oil price is down to about US\$ 80:
 - ➔ Good news?
 - ➔ Long-term problem to come back?



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?



Speculation or Supply Problem

The Key Question

The Key Question remains

➔ US\$ 147 per barrel:

A faulty indicator?

or

 A time bomb?



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?



Speculation or Supply Problem

Outline of the Presentation

- The Price of Oil
 - ✓ Speculation
 - ✓ Trends & Outlook
- Supply of Oil
 - ✓ Reserves
 - ✓ Production
- Supply Challenges: Peak Oil
 - ✓ Production Peak
 - ✓ Supply Peak
- Options for the Future

Oil Price Spike: Result of Speculation or of Overall Concern about future supply?





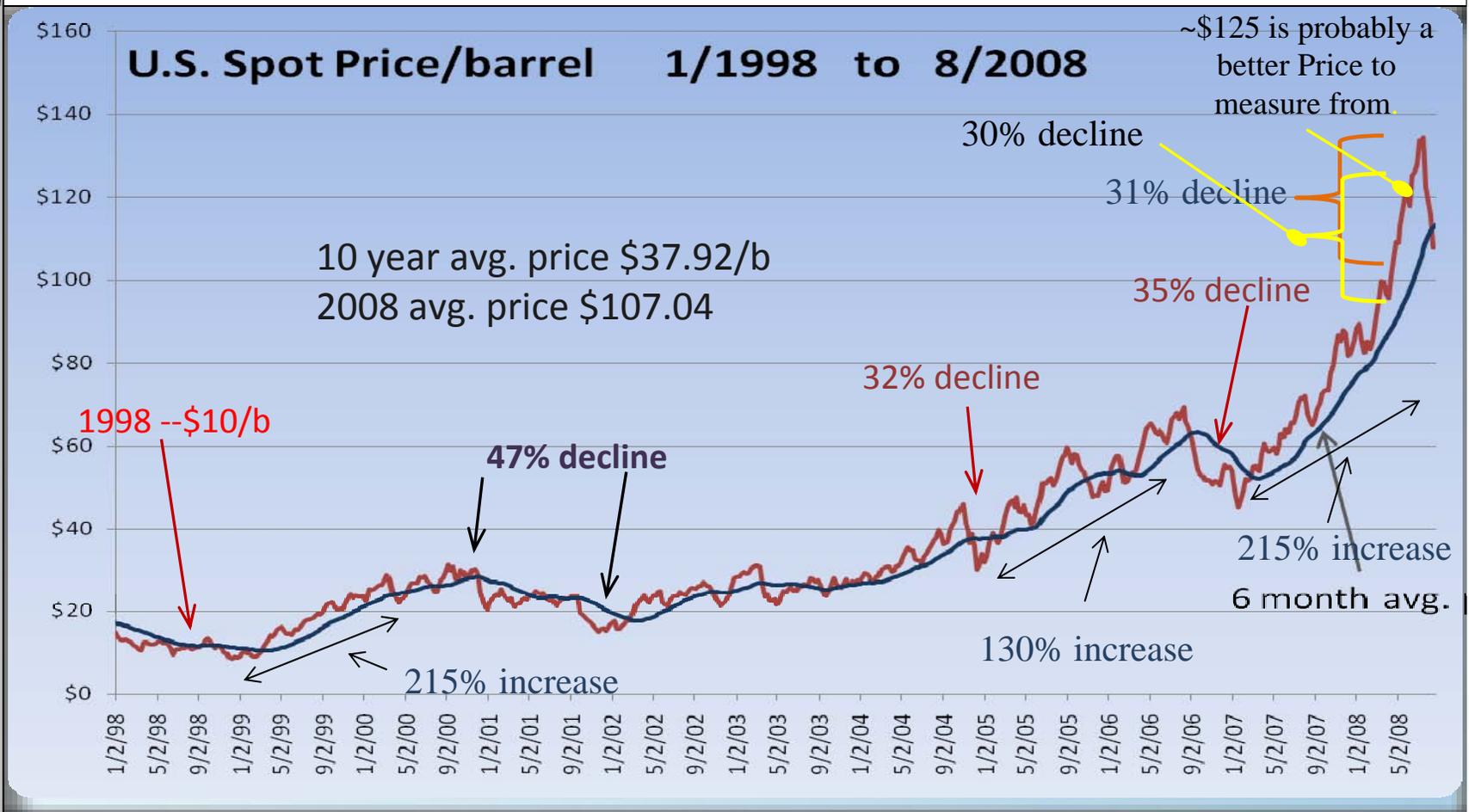
The Price of Oil

Oil Price Spike: Result of Speculation or of Overall Concern about future supply?





The Price of Oil Ten Year Development



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?



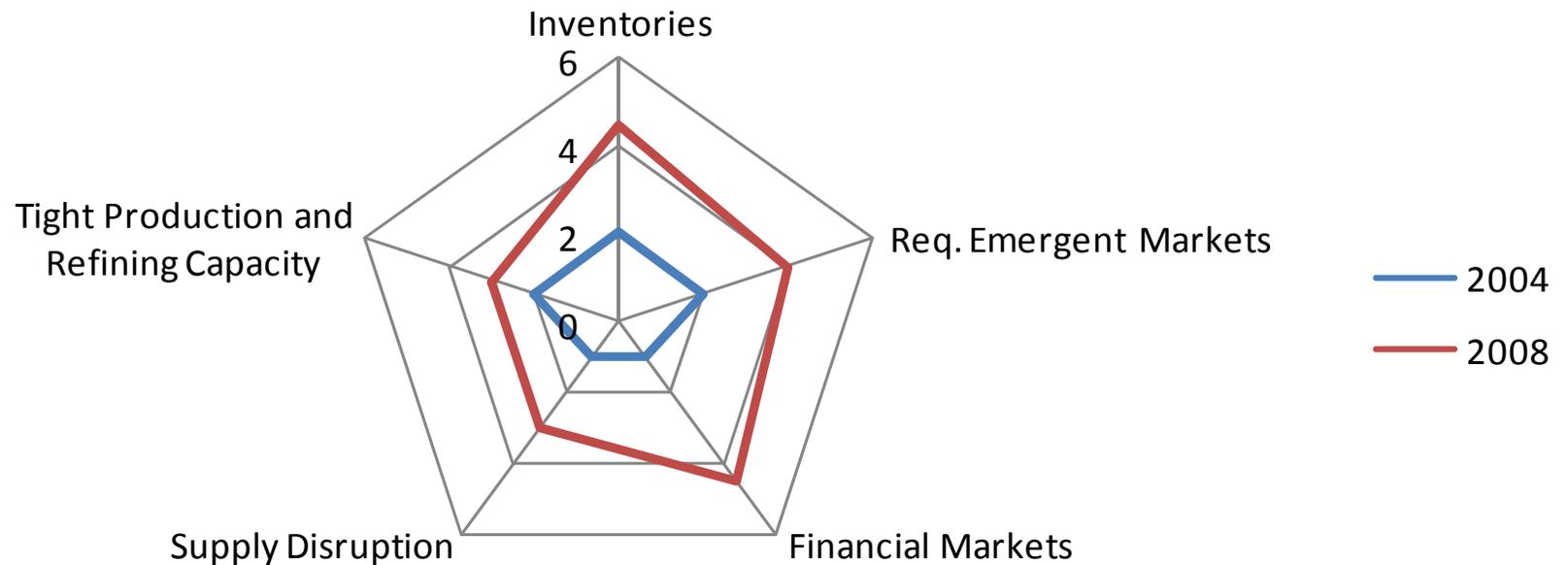
Source: EIA



The Price of Oil

Price Drivers

Relative Oil Price Drivers



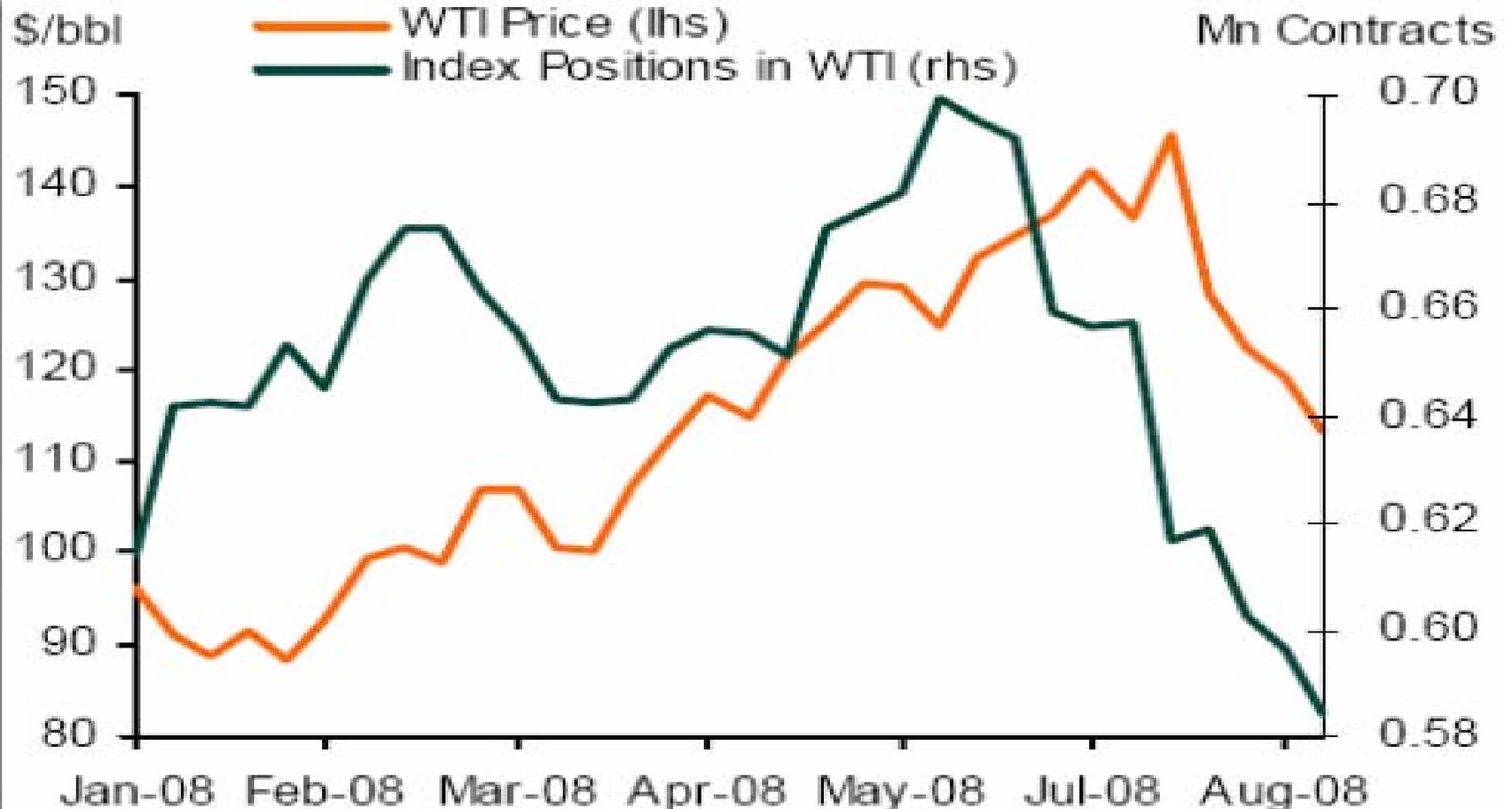
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The Price of Oil

Speculation (Futures Trading)



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?





The Price of Oil

Major Events Influencing the Price

CRUDE OIL PRICES 1970-2008

US\$ per barrel



Figures are not inflation adjusted

SOURCE: BP/Bloomberg



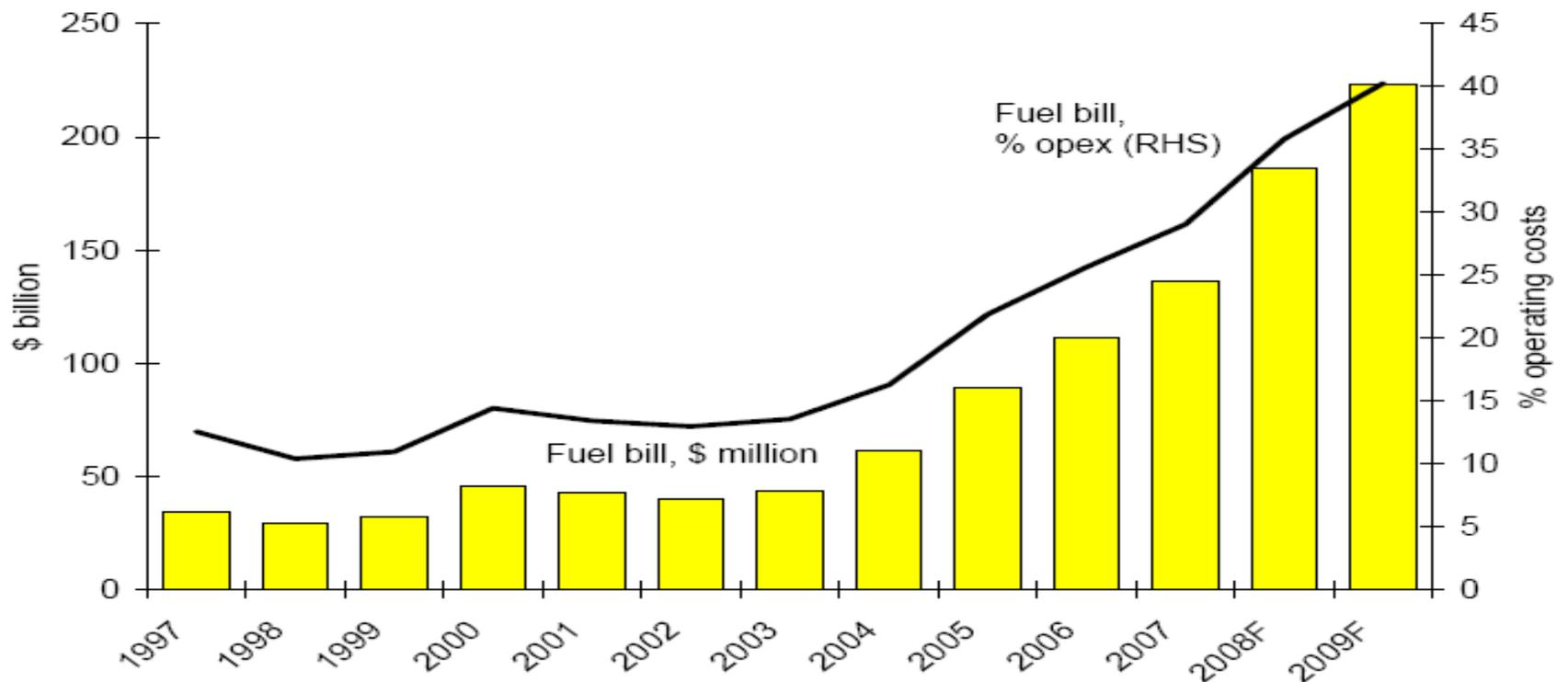
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The Price of Oil

Rising Operating Airline Cost

Fuel costs forecast to reach 40% of operating costs in 2009

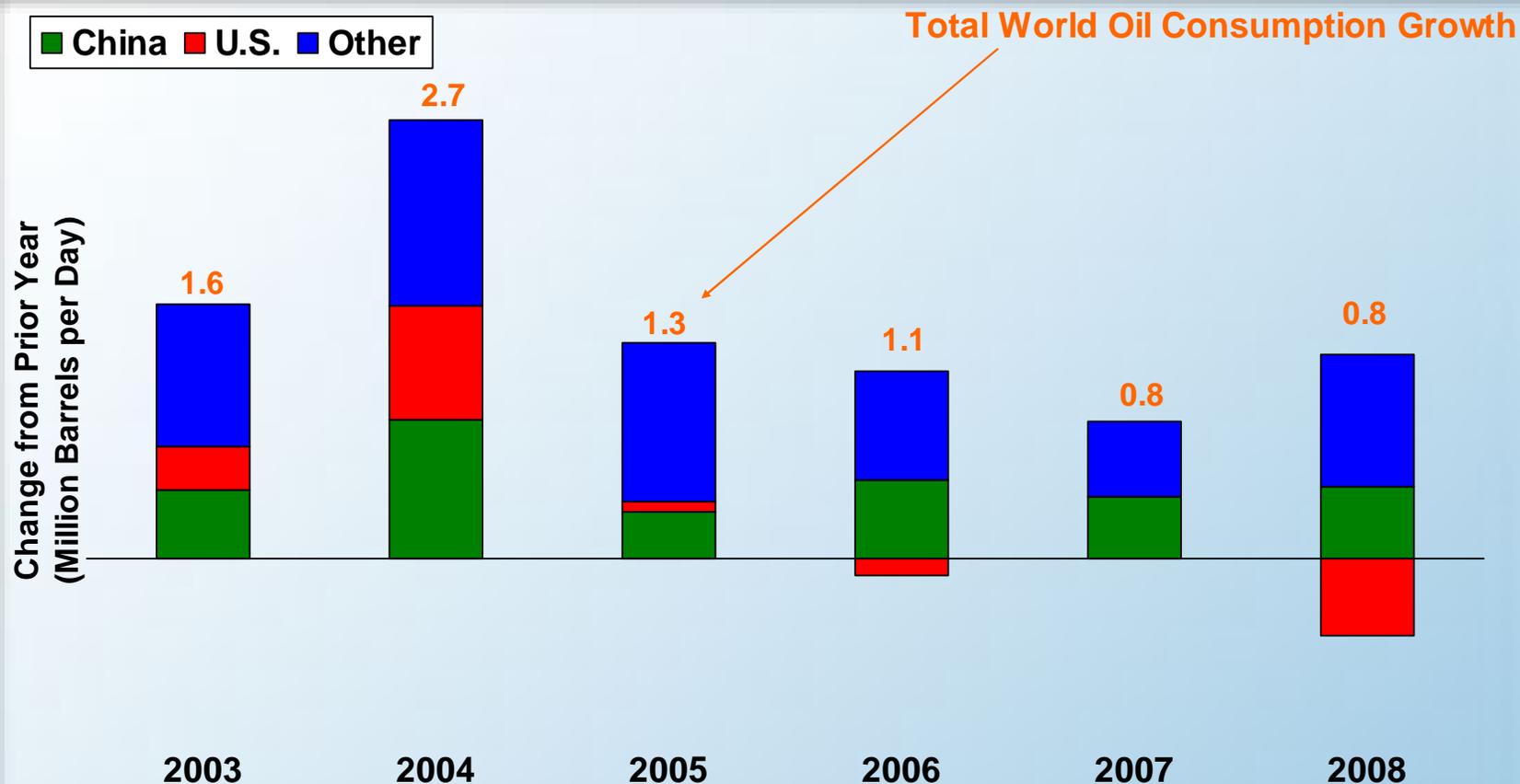


Oil Price Spike: Result of Speculation or of Overall Concern about future supply?



The Price of Oil

Increase of Consumption



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?





The Price of Oil

Increased Consumption in Emerging Markets

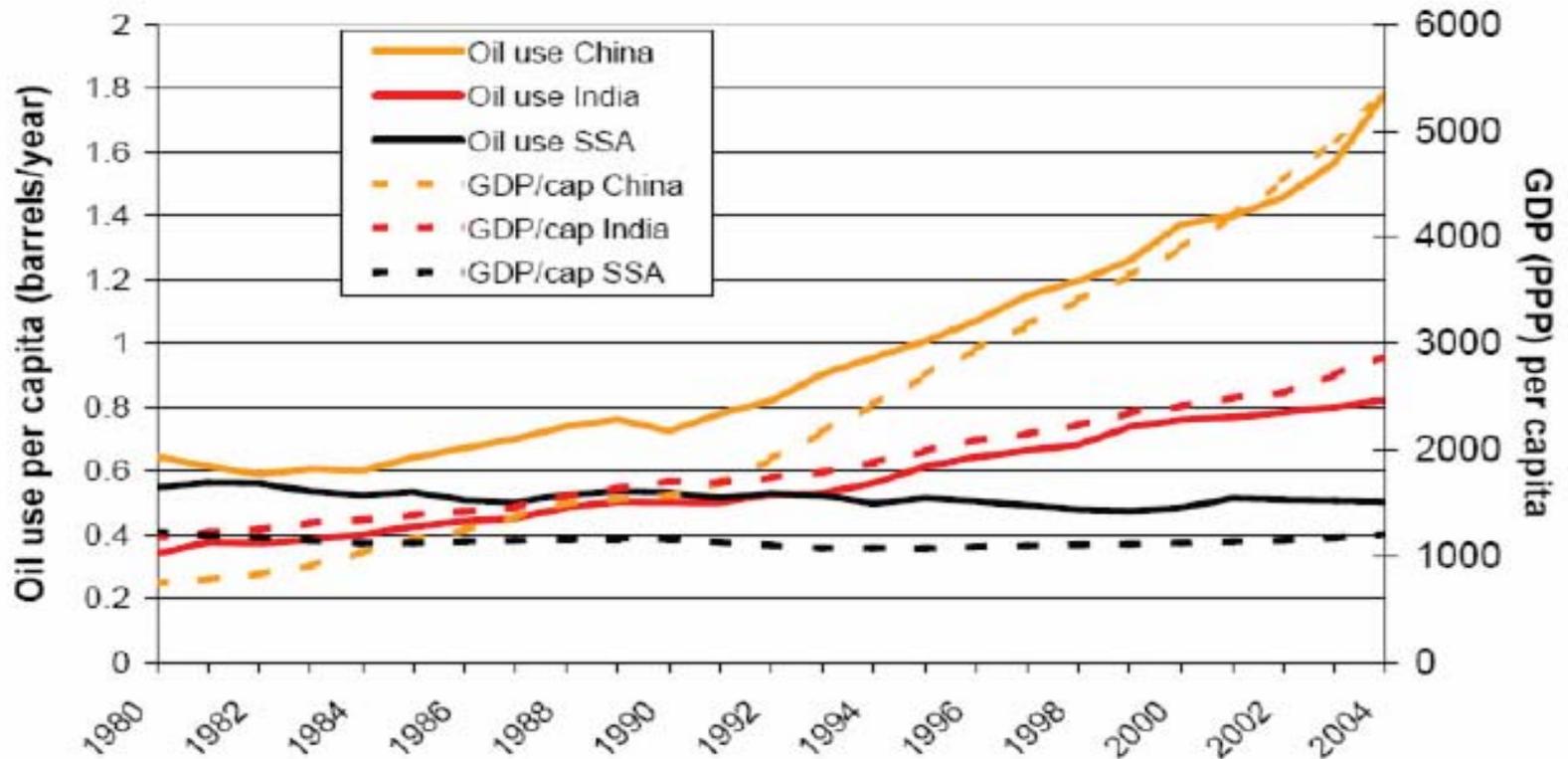


Figure 21. Development of GDP (PPP) and oil use per capita in SSA, China and India 1980-2004.

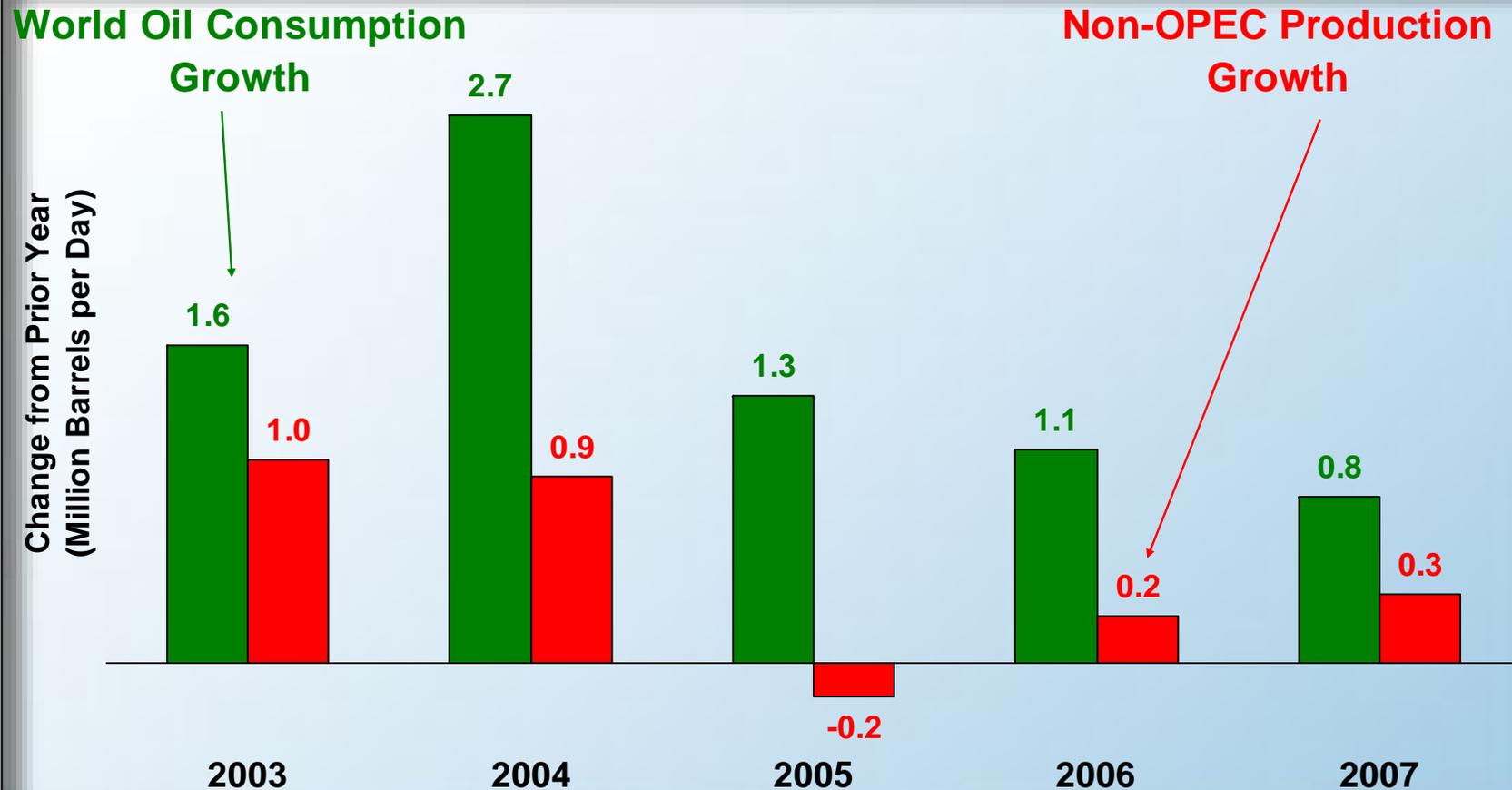
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The Price of Oil

Tight World Oil Market Balance



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?

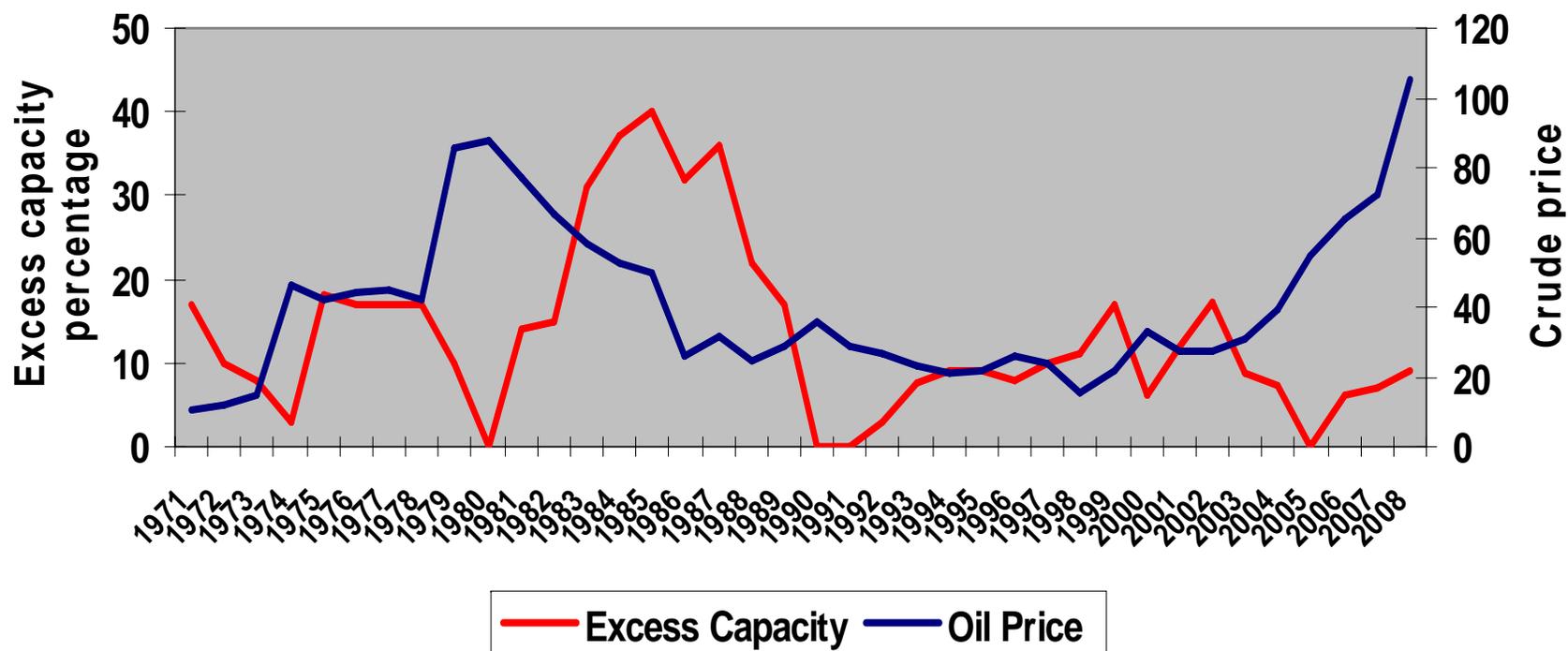




The Price of Oil

Tightening Excess Capacity

Excess capacity to produce crude oil in OPEC and crude prices
1971-2008



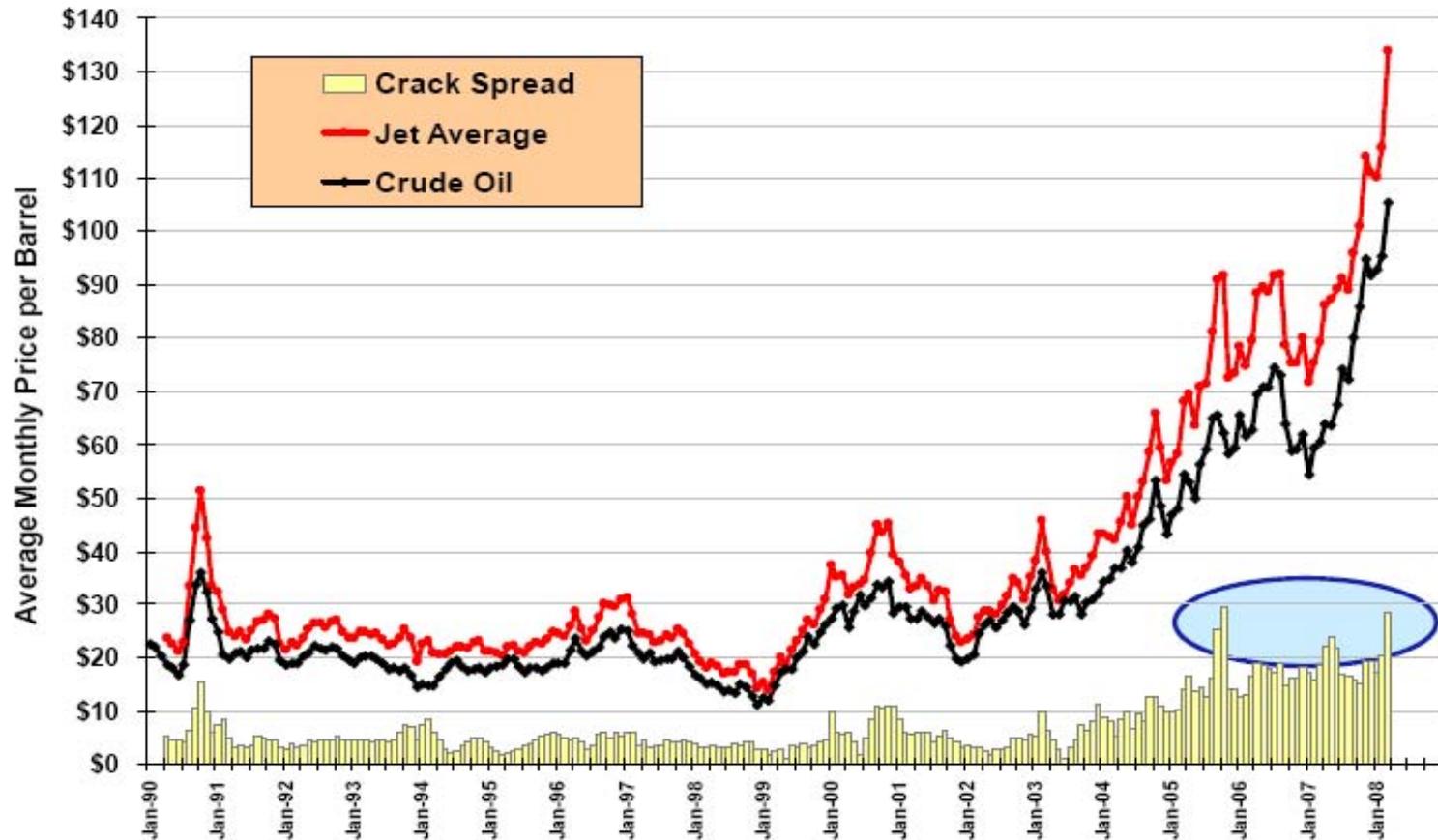
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The Price of Oil

Jet Fuel



Sources: U.S. Energy Information Administration and the Air Transport Association of America

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Oil Price Spike: Result of Speculation or of Overall Concern about future supply?

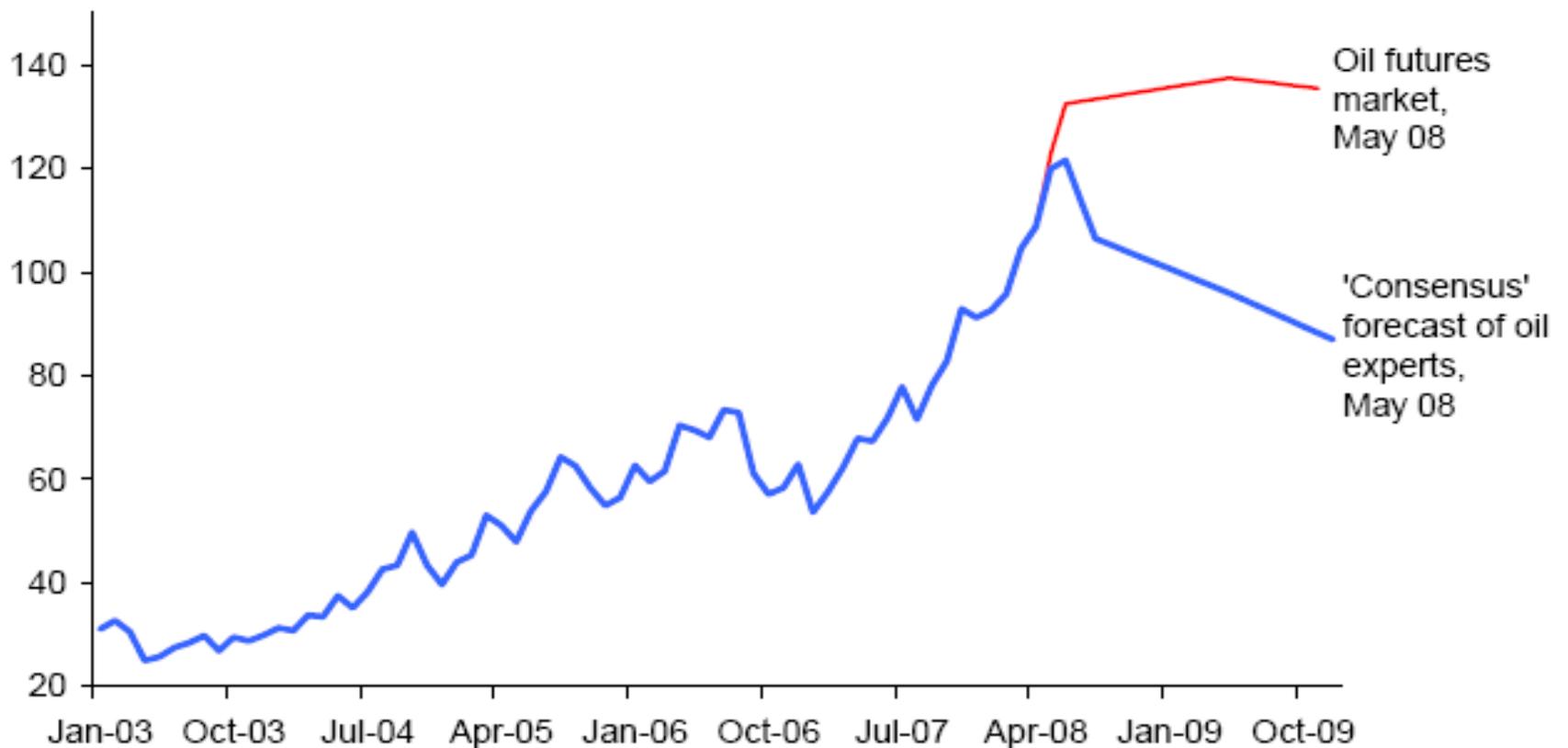




The Price of Oil

The Short-term Forecast of IATA

Brent crude oil price, US\$ per barrel



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?



The Price of Oil

Forecast of Oil and Jet Fuel

\$/b	2007	2008	2009	2010	2011	2012	2015	2020	2025	2030
<i>Forecasts developed in August 2008</i>										
EIU	73	111	91	110	112	115				
Lehman	73	115	93							
UBS	73	116	120	116	136	155				
<i>Long-term forecasts developed in 2007 and early 2008 (2006 US\$)</i>										
EIA	73			74			60	60	60	62
IEA	73			63			60	62	64	66
Global Ins.	73			68			61	55	48	46
DB	73			57			60	66	72	80
<i>IATA oil price assumption based on market forecasts</i>										
IATA base	73	113	110	112	114	116	117	131	147	165
2008US\$		113	108	108	107	106	100	100	100	100
low		113	94	96	95	95	90	85	80	80
high		122	135	135	135	135	135	135	135	135
<i>IATA jet fuel price assumption</i>										
Margin, %	25	24	24	24	24	24	24	24	24	24
IATA base	90	140	136	139	141	144	145	162	182	205
2008US\$		140	134	134	133	131	124	124	124	124

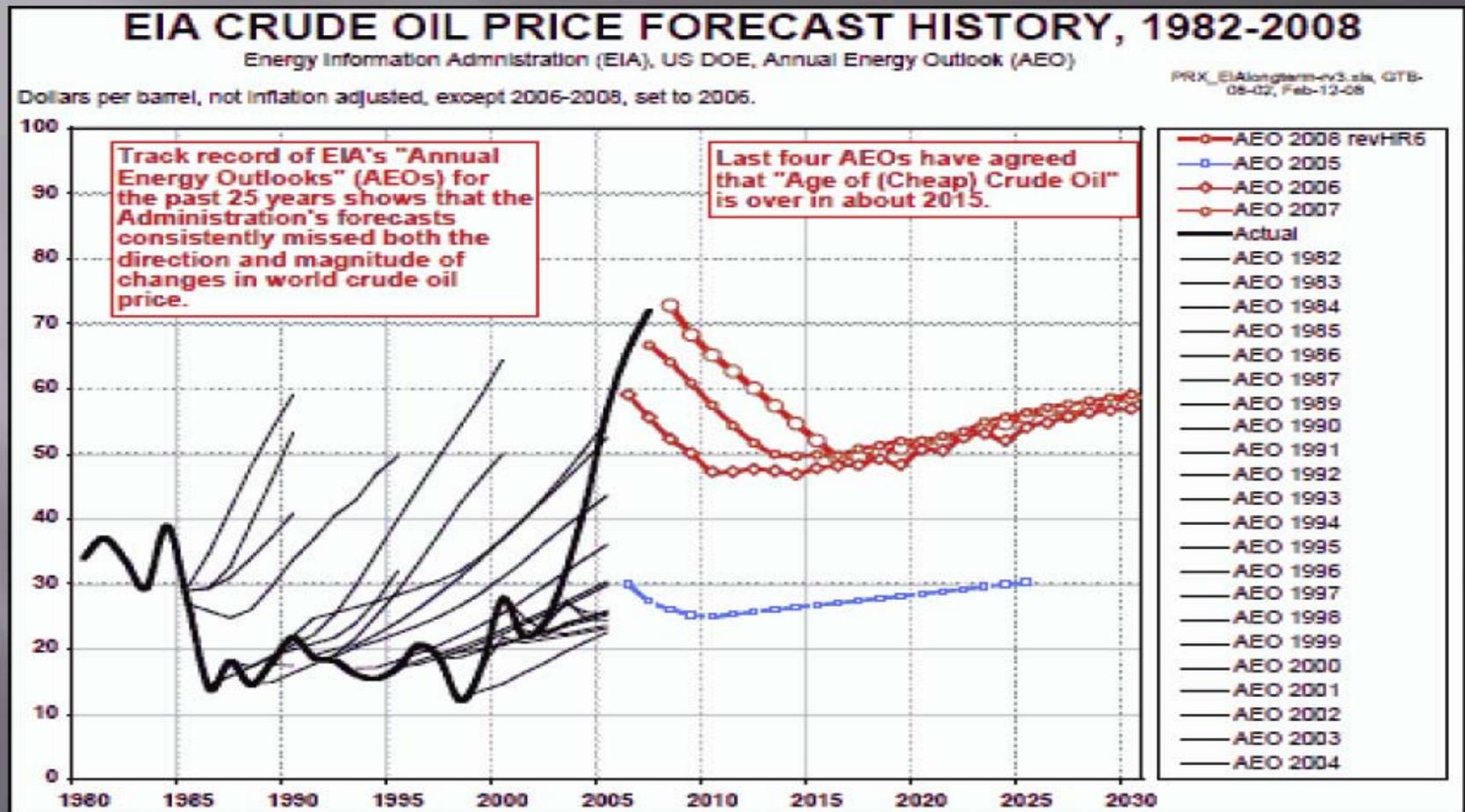
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The Price of Oil

Forecast History in the USA



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?

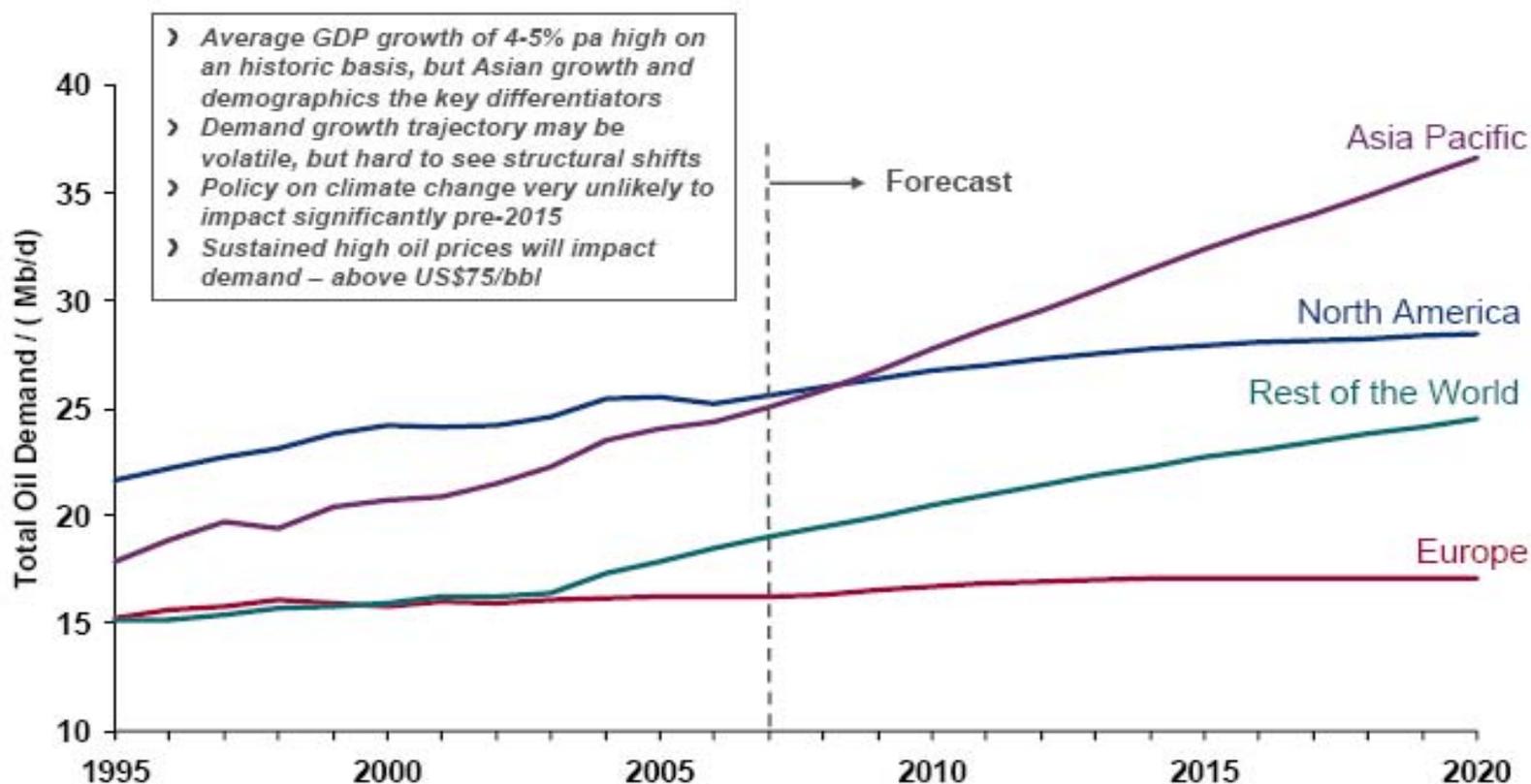




The Price of Oil

Oil Demand Growth by Region

World oil demand growth by region to 2020: Asia Pacific total set to overtake North America in 2008



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?





The Price of Oil

Air Transport Estimates

- ❖ IATA forecasts sufficient supply of oil until 2052 at current consumption of 85 million barrels per day
- ❖ Price should stabilize below US\$ 100, around US\$ 80 per barrel (IATA May 08)
- ❖ Boeing forecasts Oil to stabilize at \$70-\$80 per barrel (September 2008)



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?



Supply of Oil

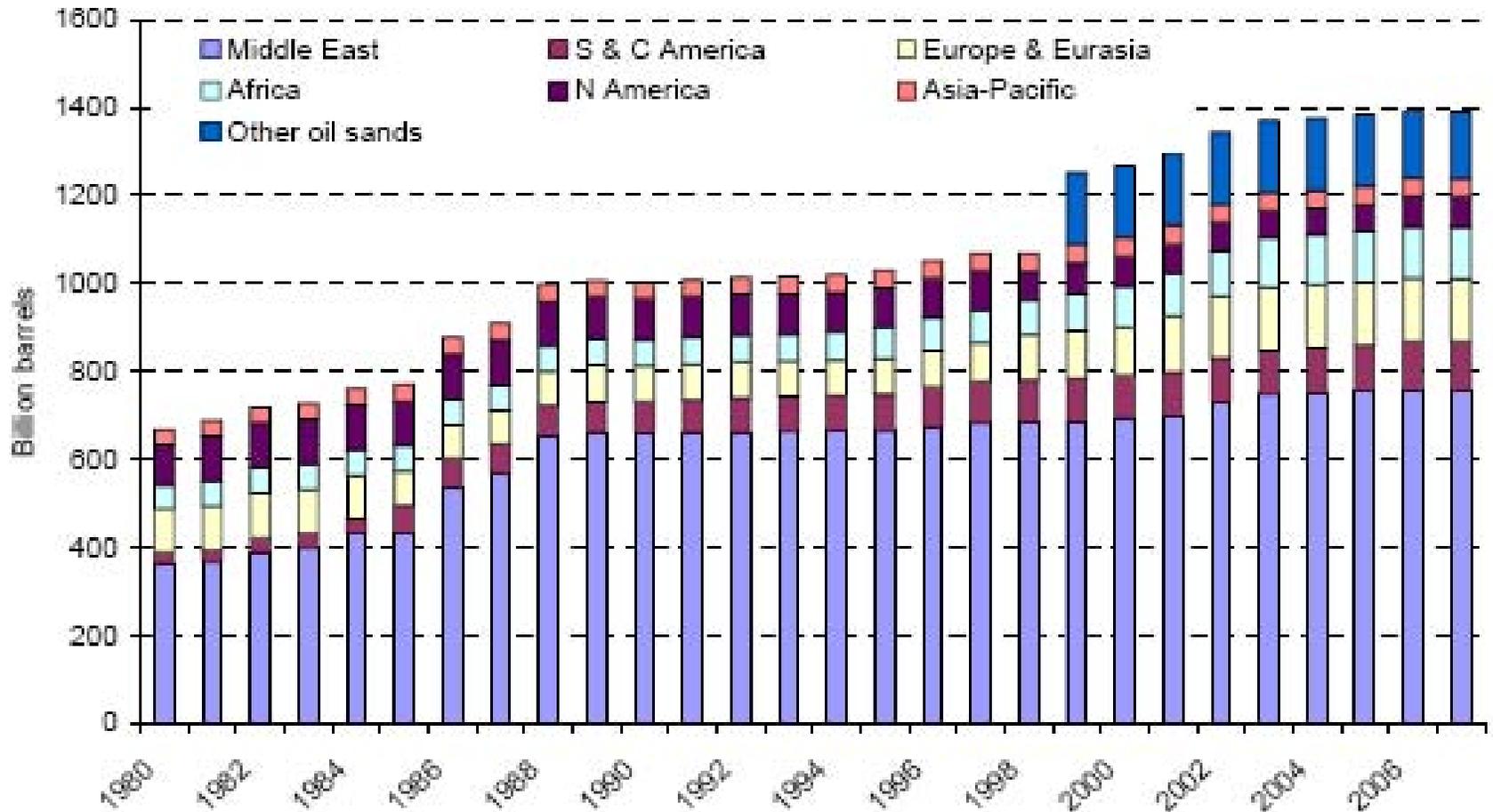
Oil Price Spike: Result of Speculation or of Overall Concern about future supply?





The Supply of Oil

Estimated Oil Reserves



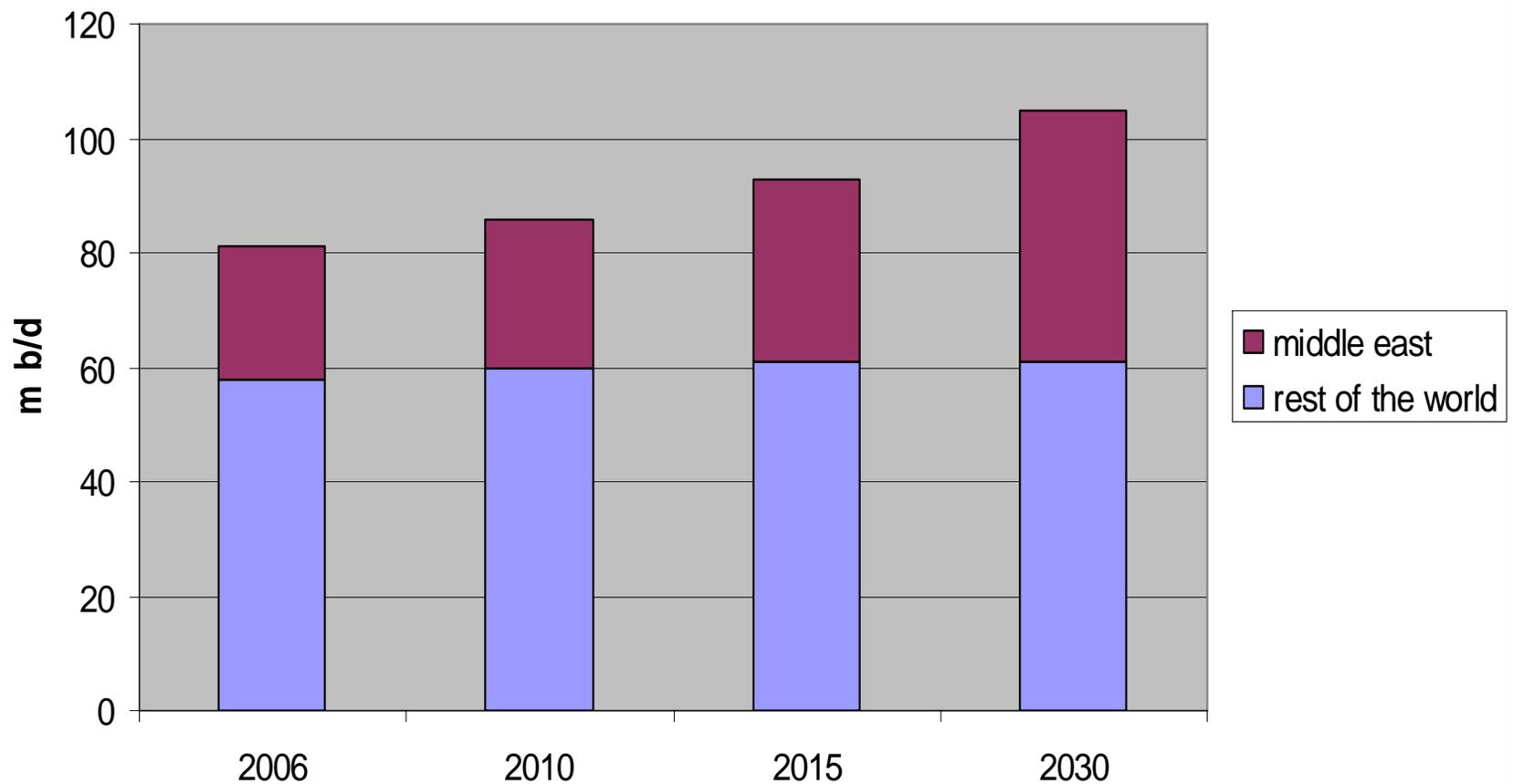
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The Supply of Oil

Supply Origins of Oil

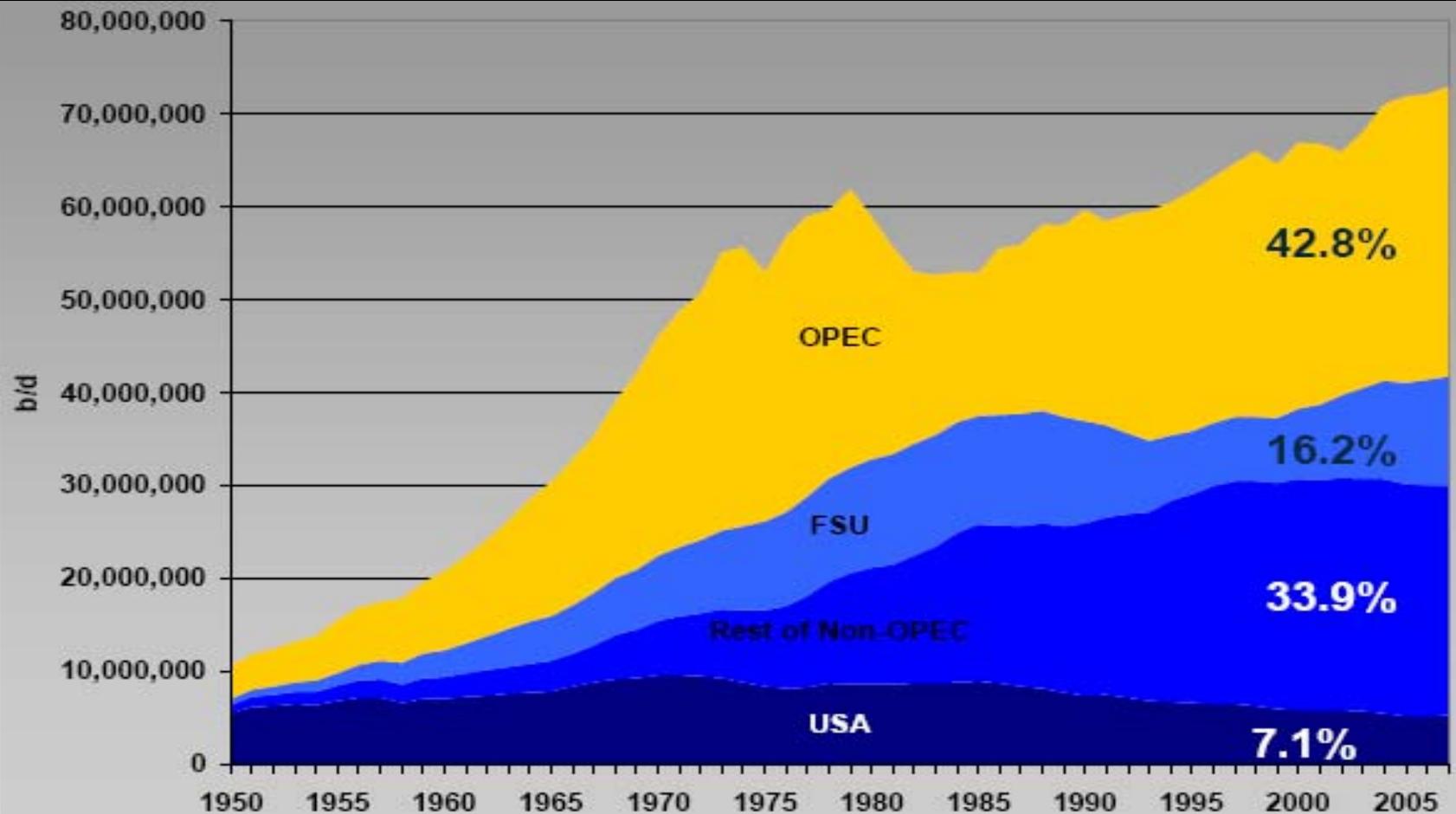


Oil Price Spike: Result of Speculation or of Overall Concern about future supply?



The Supply of Oil

Origins of Oil Production



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?

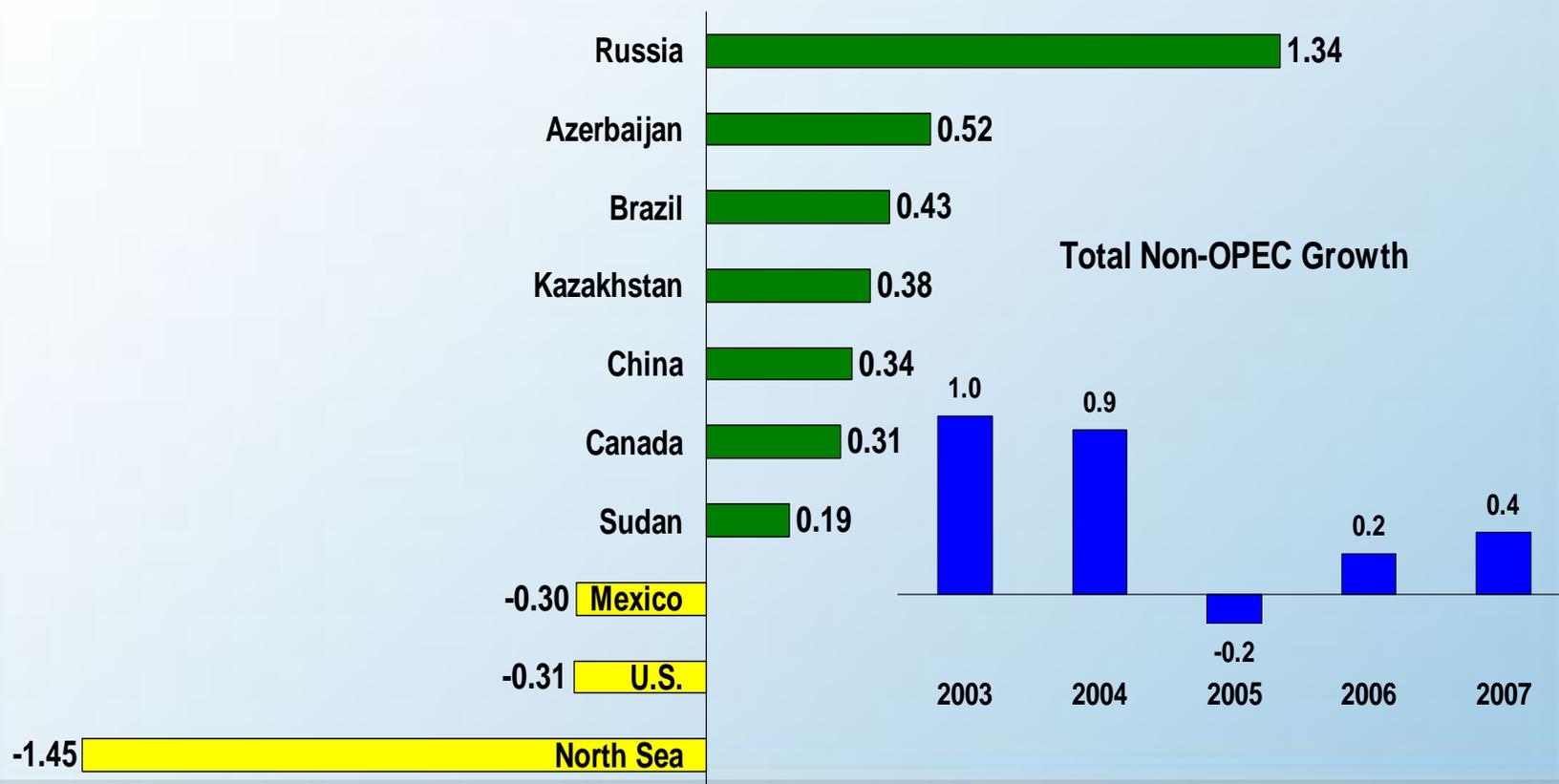




The Supply of Oil

Past non-OPEC Supply Growth

Cumulative Oil Production Change, 2003-2007 (Million Barrels per Day)



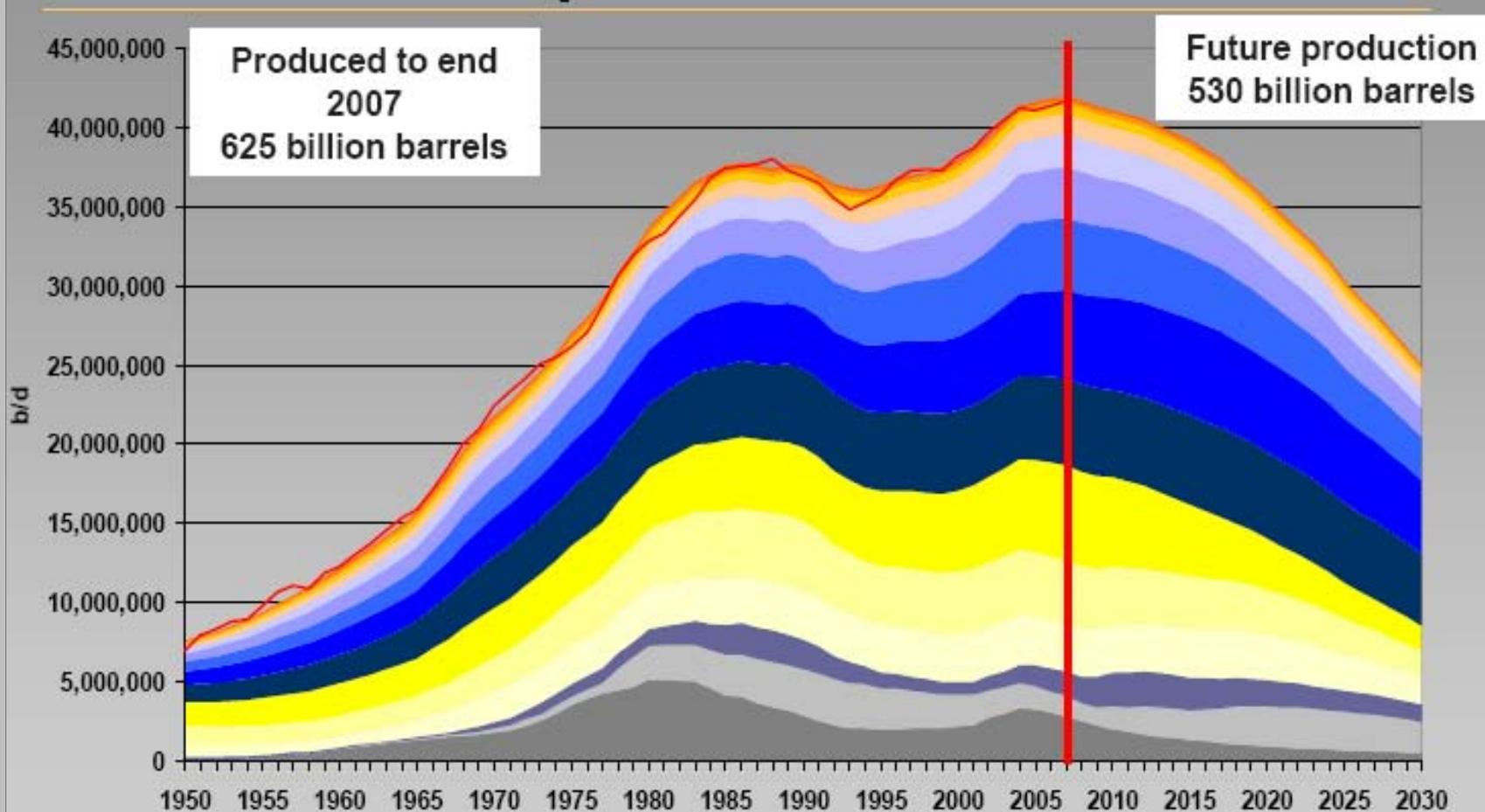
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The Supply of Oil

Non-OPEC has Peaked

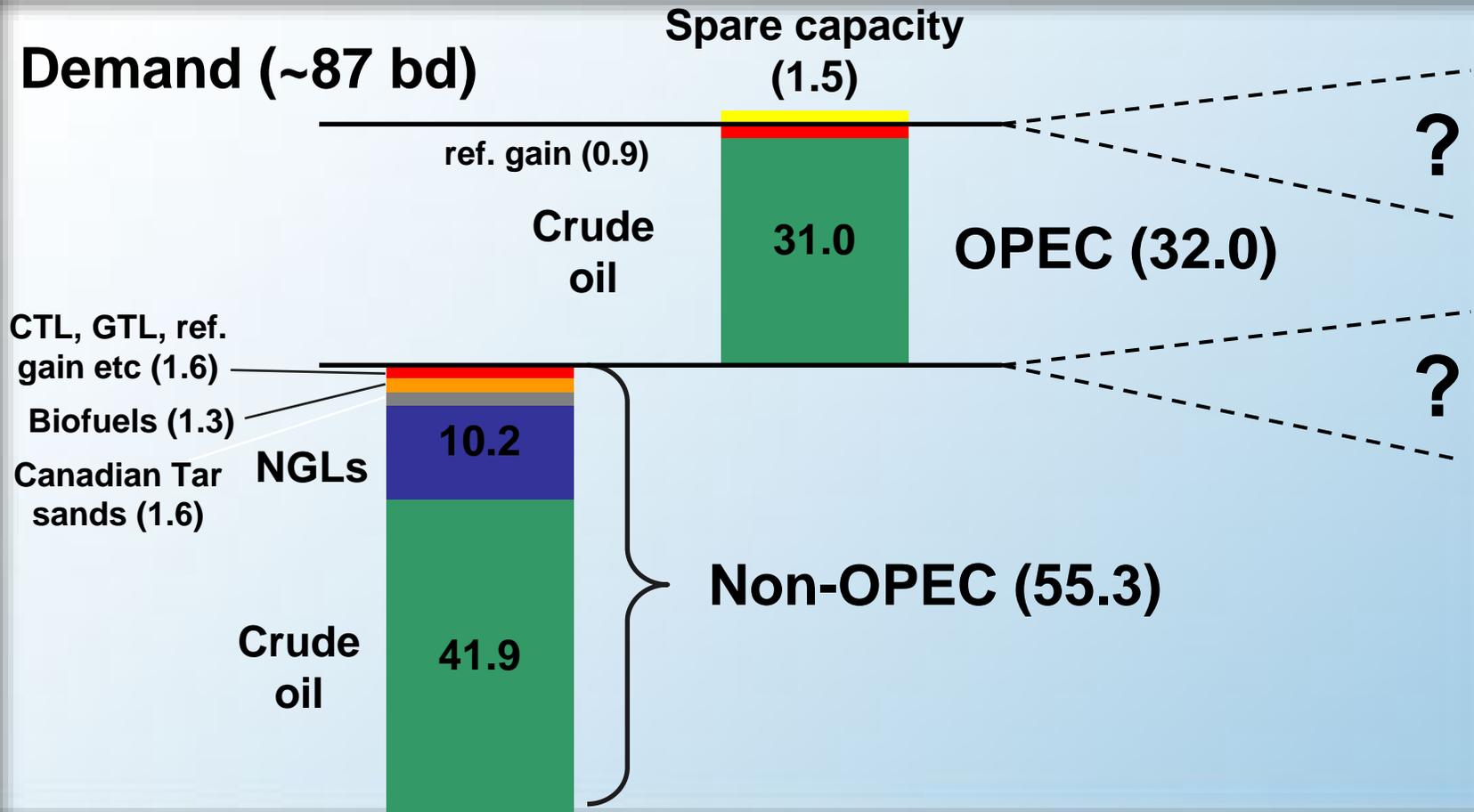


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The Supply of Oil

Supply Origins of Oil



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?





The Supply of Oil

Supply Origins of Oil

OPEC is expected to substantially increase production, but who can?

US DOE estimates for OPEC

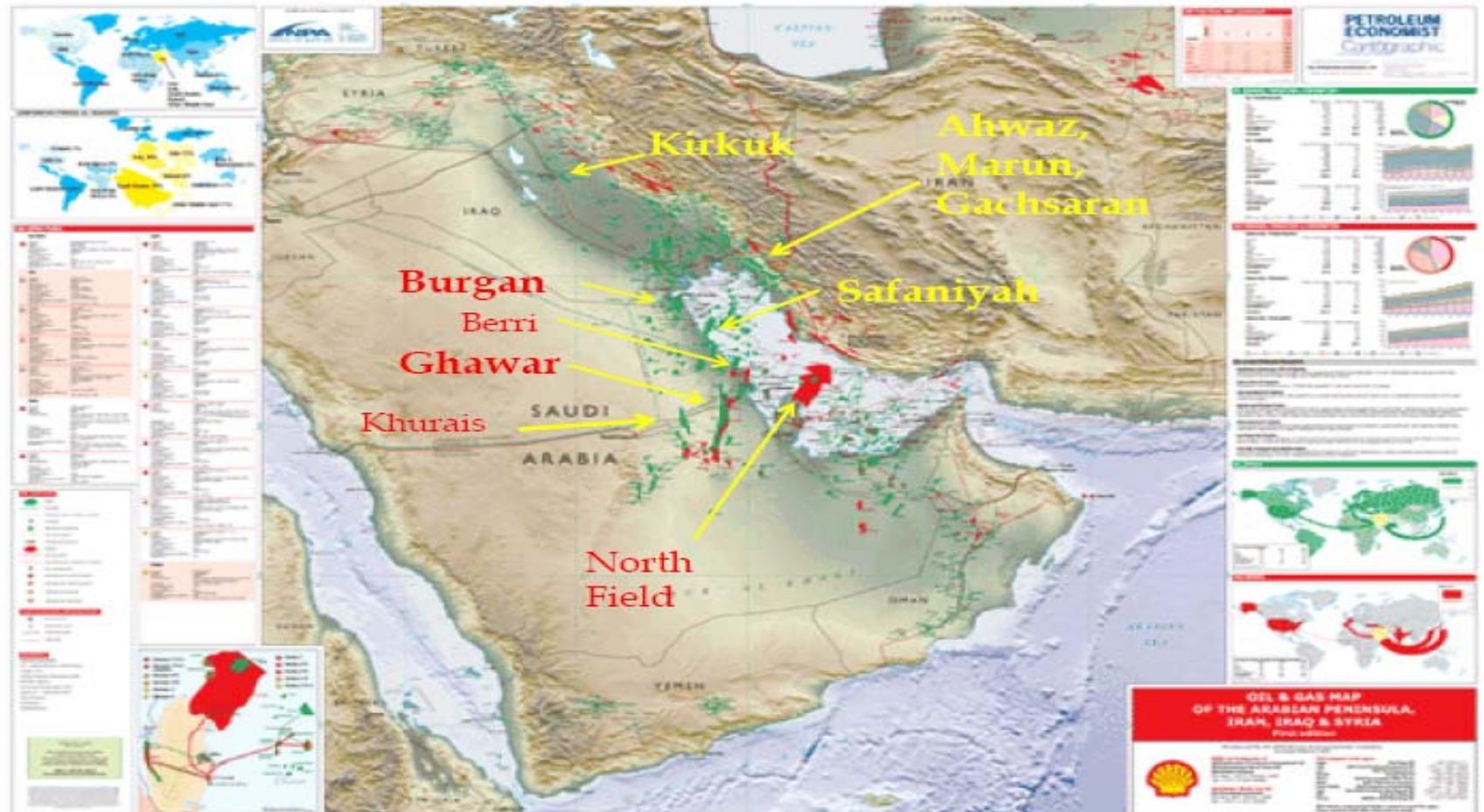
	year 2005 projection				year 2025 projection			
	Real Price	World Oil Demand (mbd)	Non-OPEC Oil Supply (mbd)	OPEC Oil Output (mbd)	Real Price	World Oil Demand (mbd)	Non-OPEC Oil Supply (mbd)	OPEC Oil Output (mbd)
AEO 2003	\$ 23.27	80.5	49.7	30.8	\$ 26.57	122.9	61.7	61.2
AEO 2004	\$ 23.86	81.9	50.4	31.5	\$ 27.00	117.5	63.9	53.7
AEO 2005	\$ 33.99	83.8	50.7	33.1	\$ 30.31	120.2	65.0	55.1
AEO 2006	\$ 49.70	84.2	52.0	32.2	\$ 47.99	110.6	67.8	42.8

Oil Price Spike: Result of Speculation or of Overall Concern about future supply?





The Supply of Oil Saudi Arabia



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?





The Supply of Oil

Saudi Arabia – Some Facts

- ✓ **Saudi reserves are estimated at 263 billion barrels (2003), which is 23% of World reserves – no depletion ?**
- ✓ **Pre-OPEC (1979) proven reserves were 110 bb & 70 possible reserves**
- ✓ **Five large oil fields, of which two, Ghawar and Safaniya, produce 75%**
- ✓ **Ghawar is 50 years old, and has produced 55 billions, 18 last decade**

Oil Price Spike: Result of Speculation or of Overall Concern about future supply?





The Supply of Oil

Saudi Arabia – King Abdullah's Message



"The oil boom is over and will not return. All of us must get used to a different lifestyle."



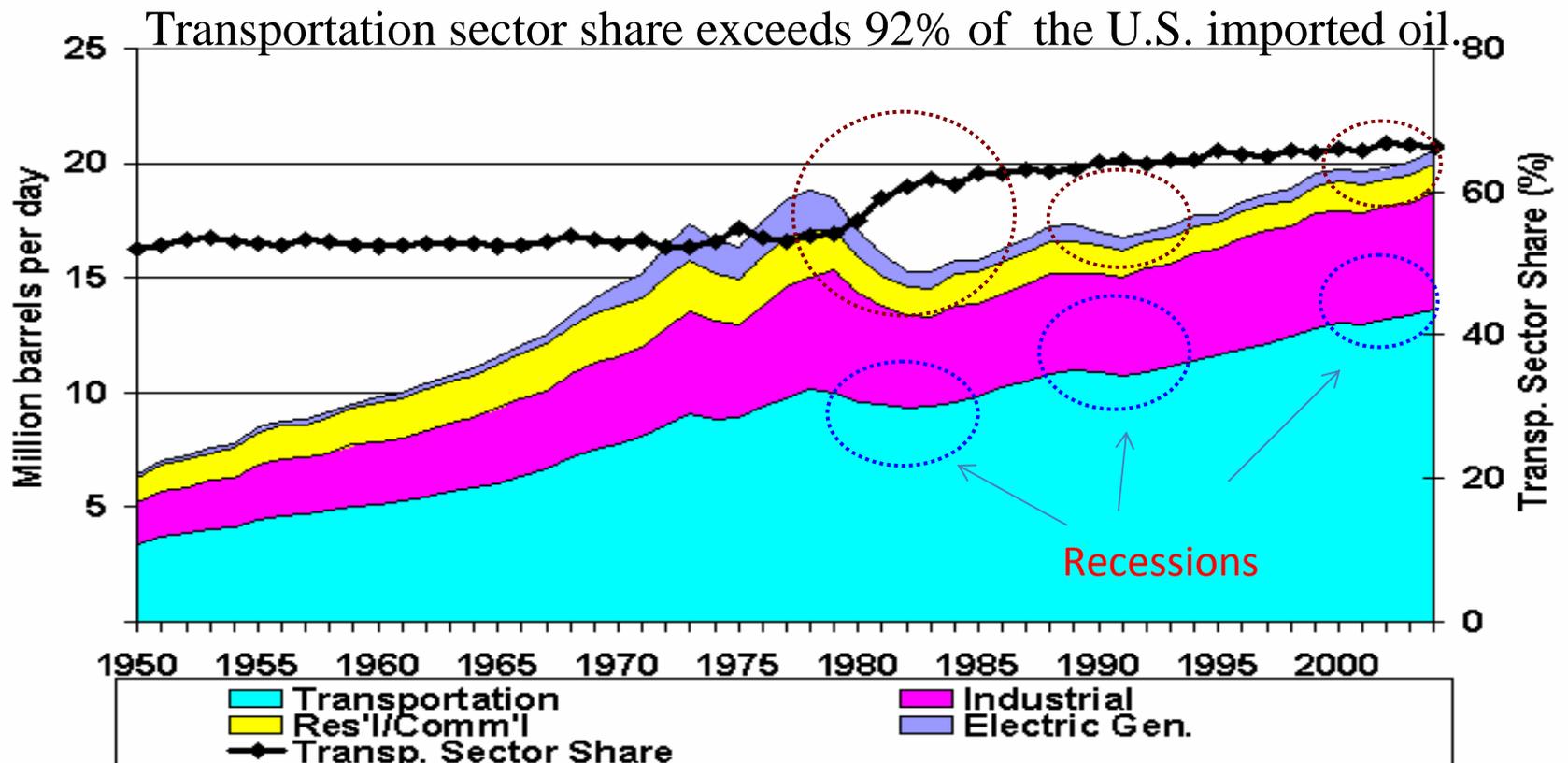
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The Supply of Oil

Oil Demand by Sector in the US

U.S. Oil Demand by Sector, 1950-2004



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?

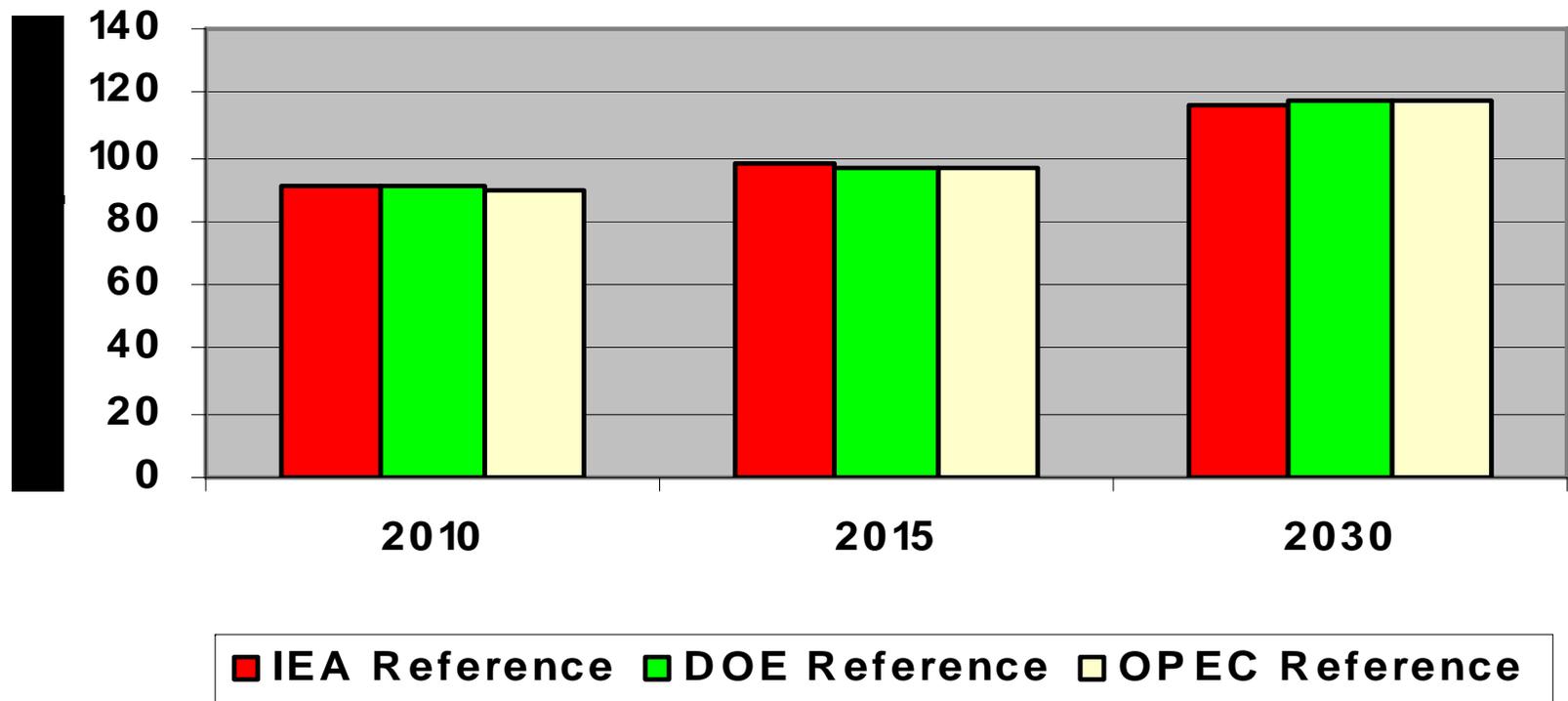




The Supply of Oil

Demand Estimates

Oil Demand Projections Compared



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?

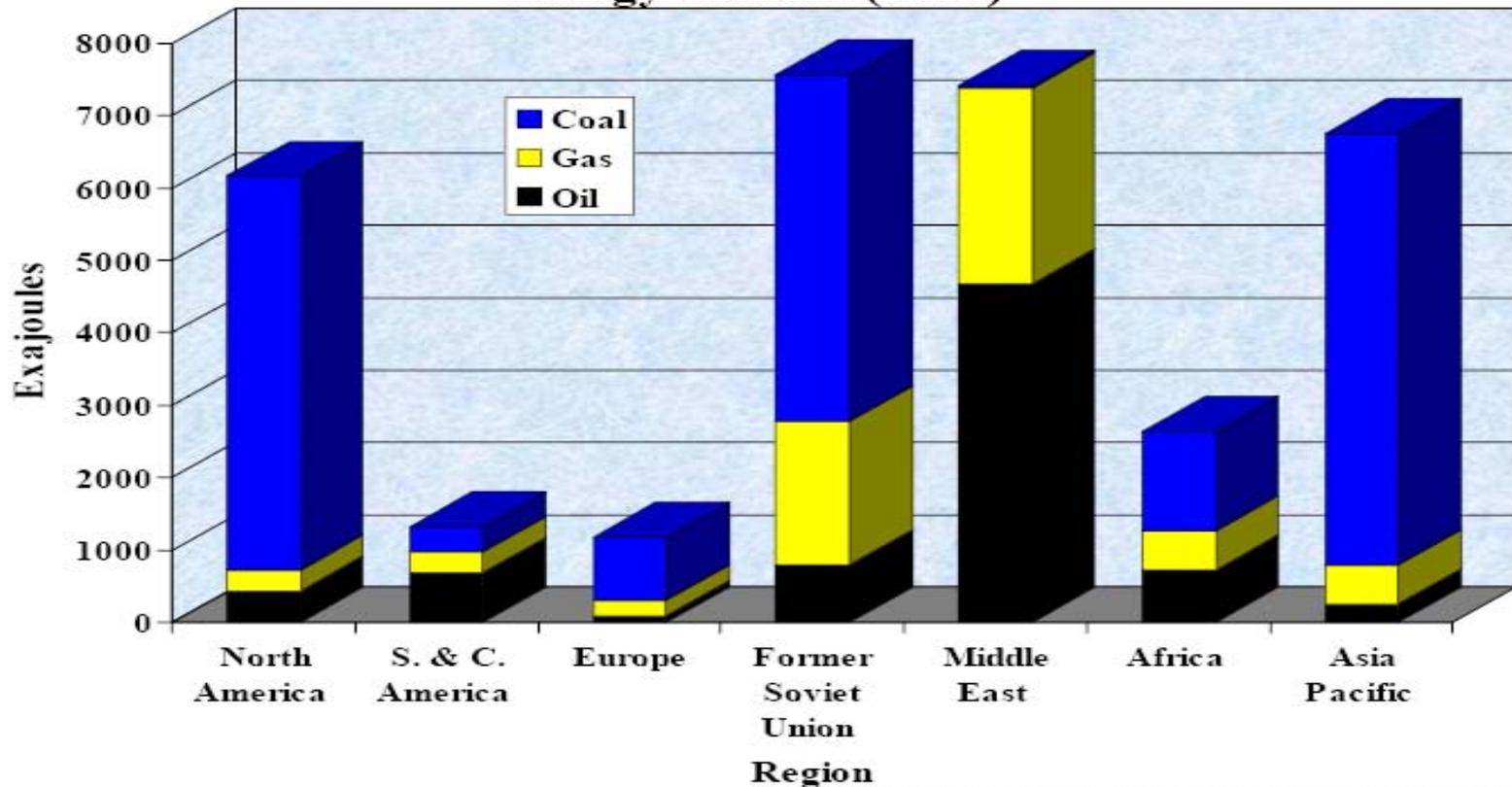




The Supply of Oil

Supply Origins in Terms of Energy

World Remaining Recoverable Hydrocarbon Reserves by Energy Content (2007)



(data from BP Statistical Review of World Energy, 2008)



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?



Supply Challenges

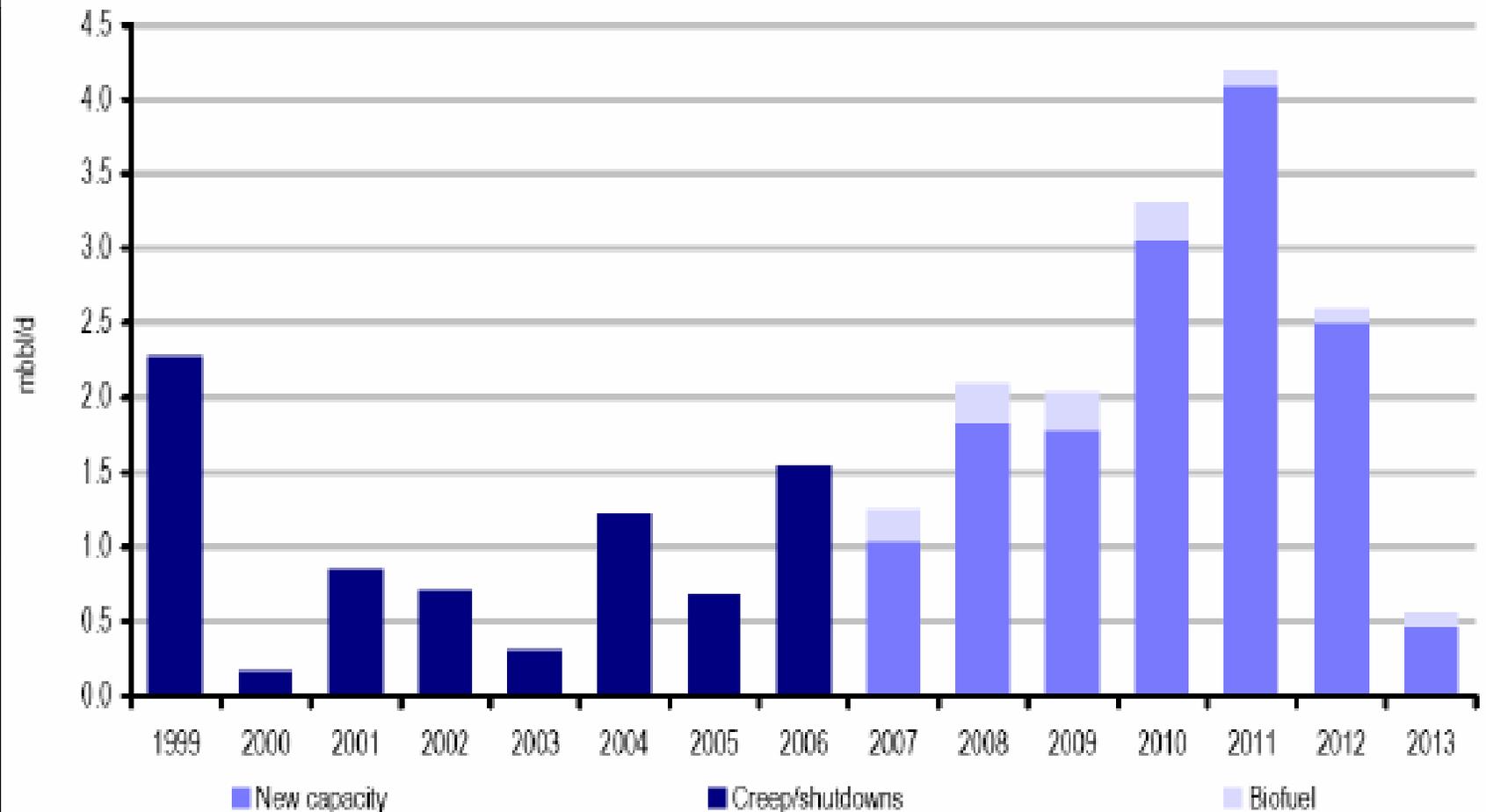
Oil Price Spike: Result of Speculation or of Overall Concern about future supply?





Supply Challenges: Peak Oil

Additional Refinery Capacity



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?



Supply Challenges: Peak Oil Production Capacity Peak

- **Not enough money and expertise were invested in the 1990s to maintain excess capacity to produce crude. (Prof. Paul Stevens)**
- **Chatham House report predicts a resulting oil price spike which could exceed \$200/barrel.**

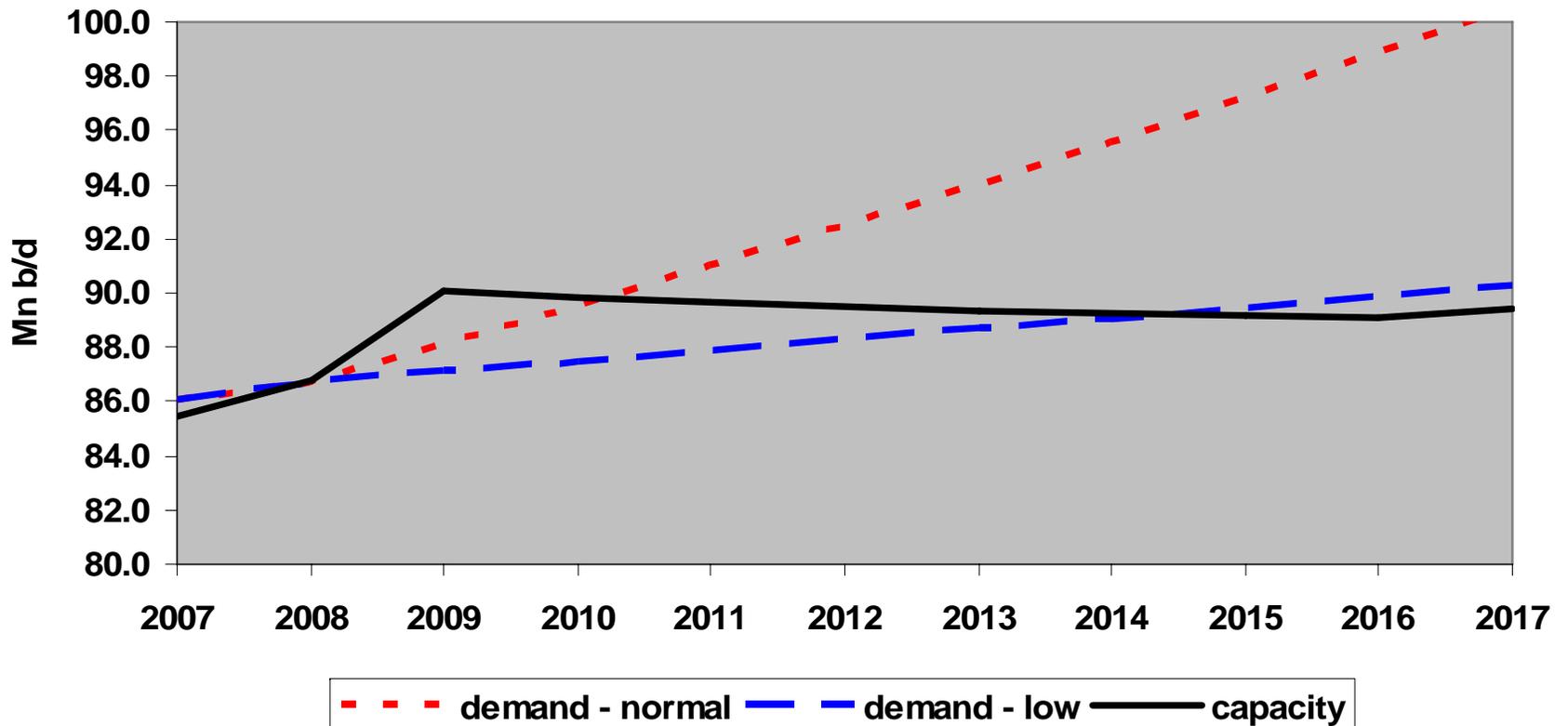


Oil Price Spike: Result of Speculation or of Overall Concern about future supply?



Supply Challenges: Peak Oil Production Capacity Peak

oil demand and capacity estimates



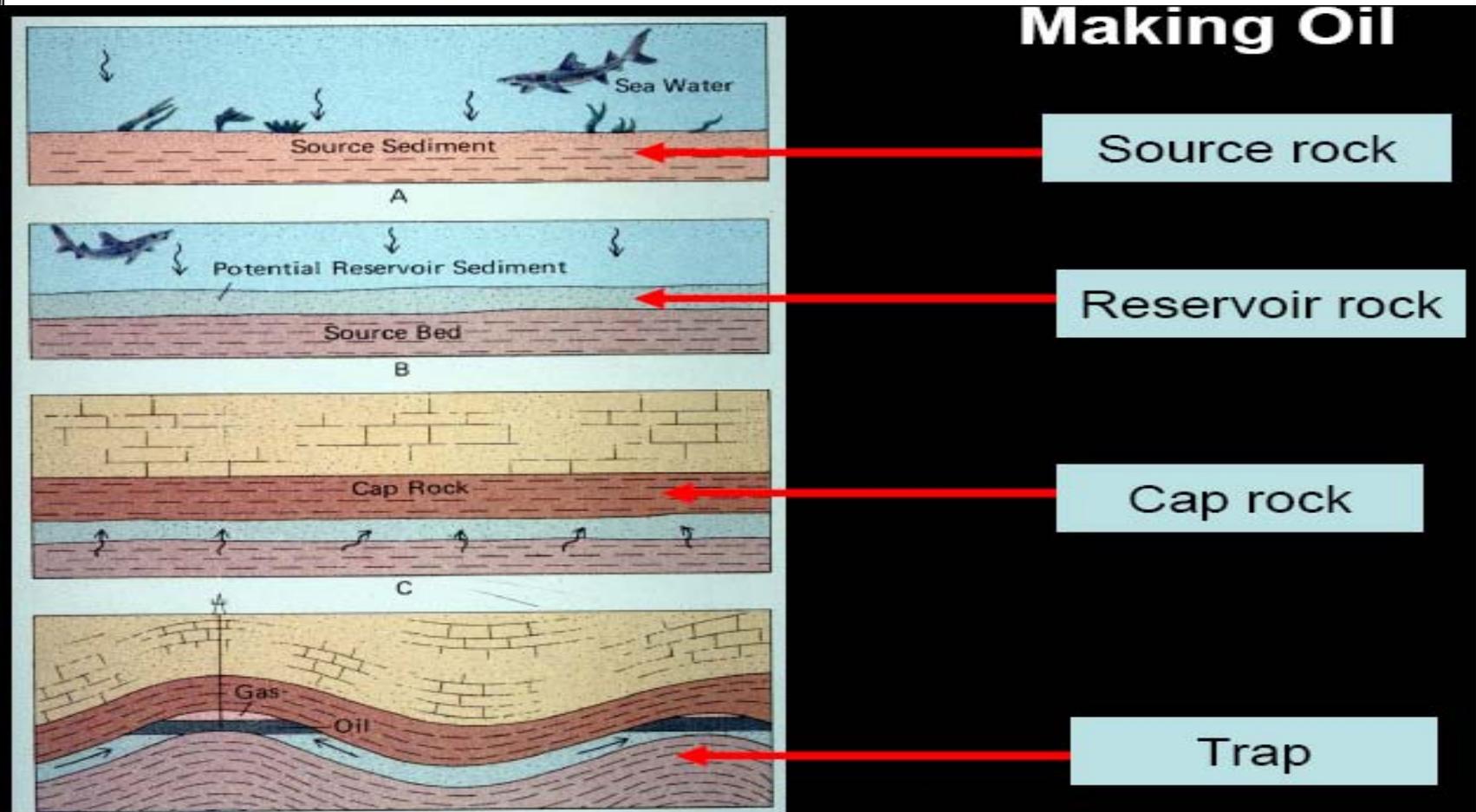
*Oil Price Spike: Result of Speculation or of
Overall Concern about future supply?*





Supply Challenges: Peak Oil

The Making of Oil



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?

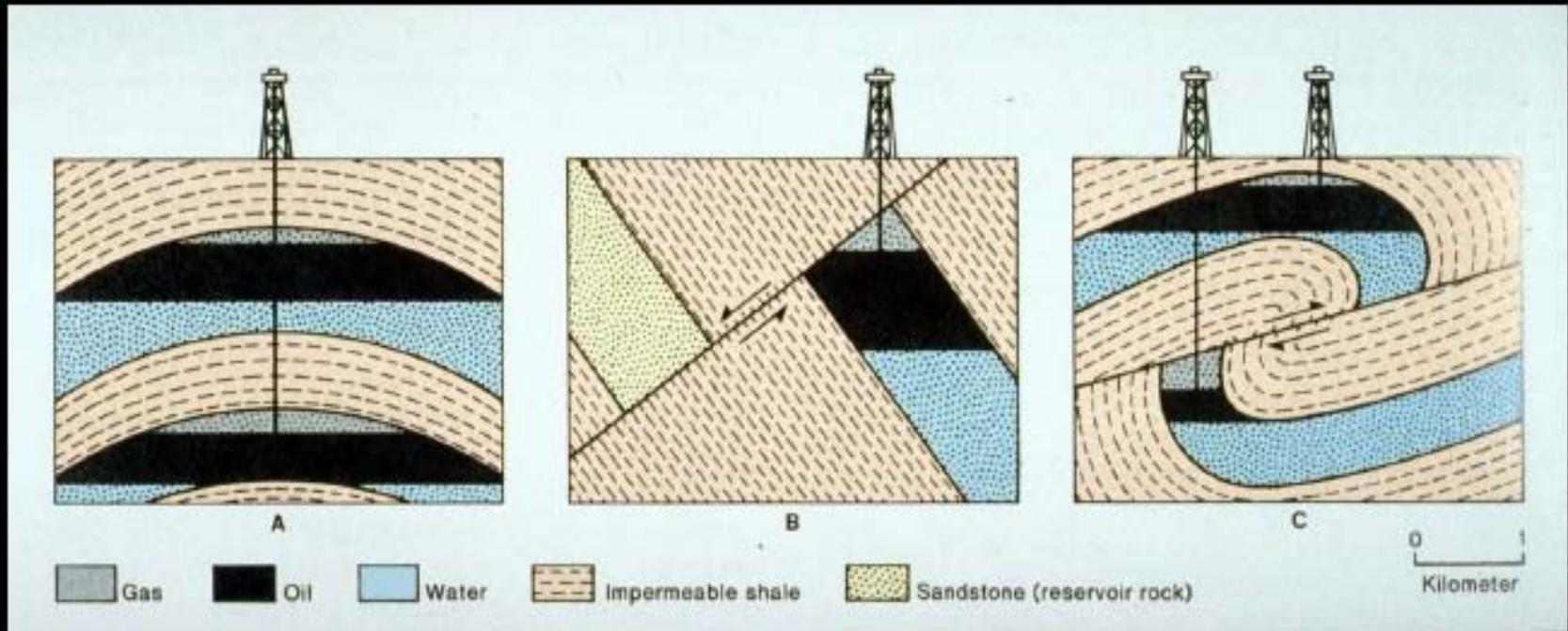




Supply Challenges: Peak Oil

The Origins of Oil

Oil is trapped in traps.



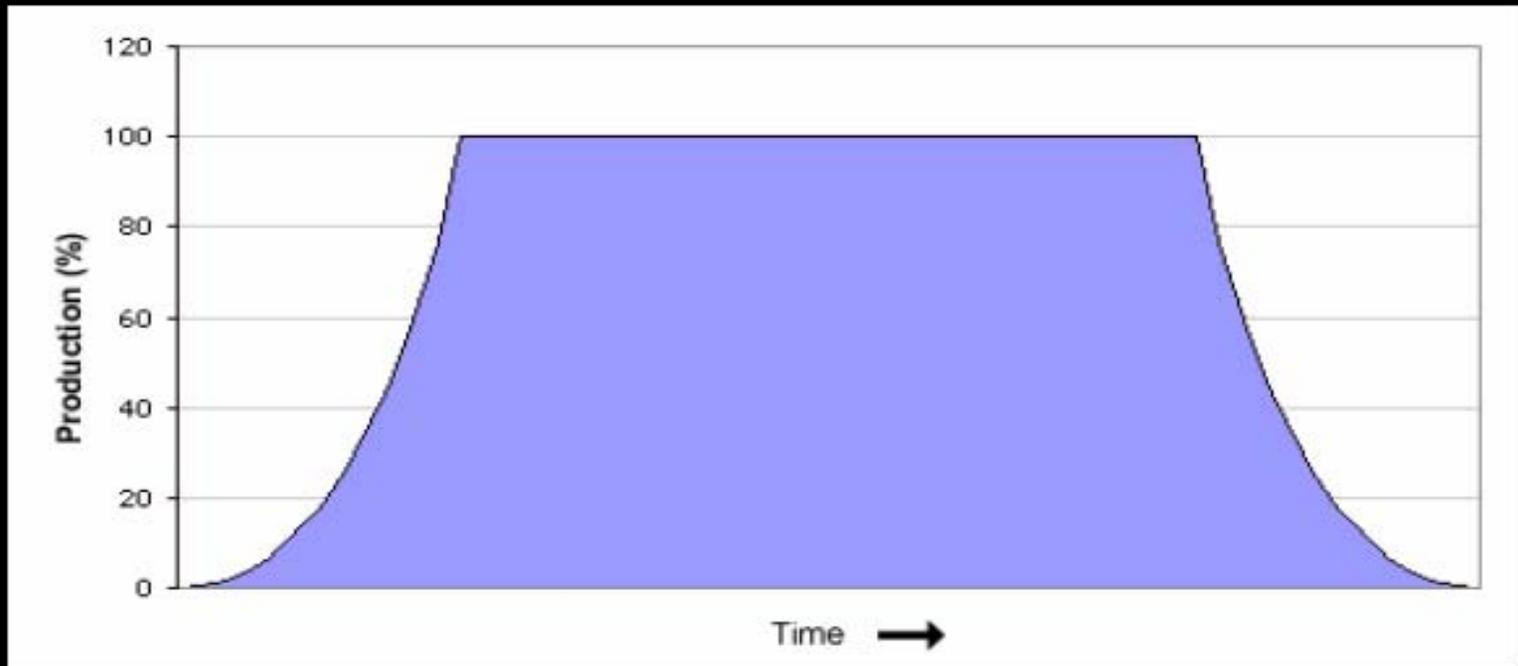
Oil Price Spike: Result of Speculation or of Overall Concern about future supply?





Supply Challenges: Peak Oil

Drilling of an Oil Well



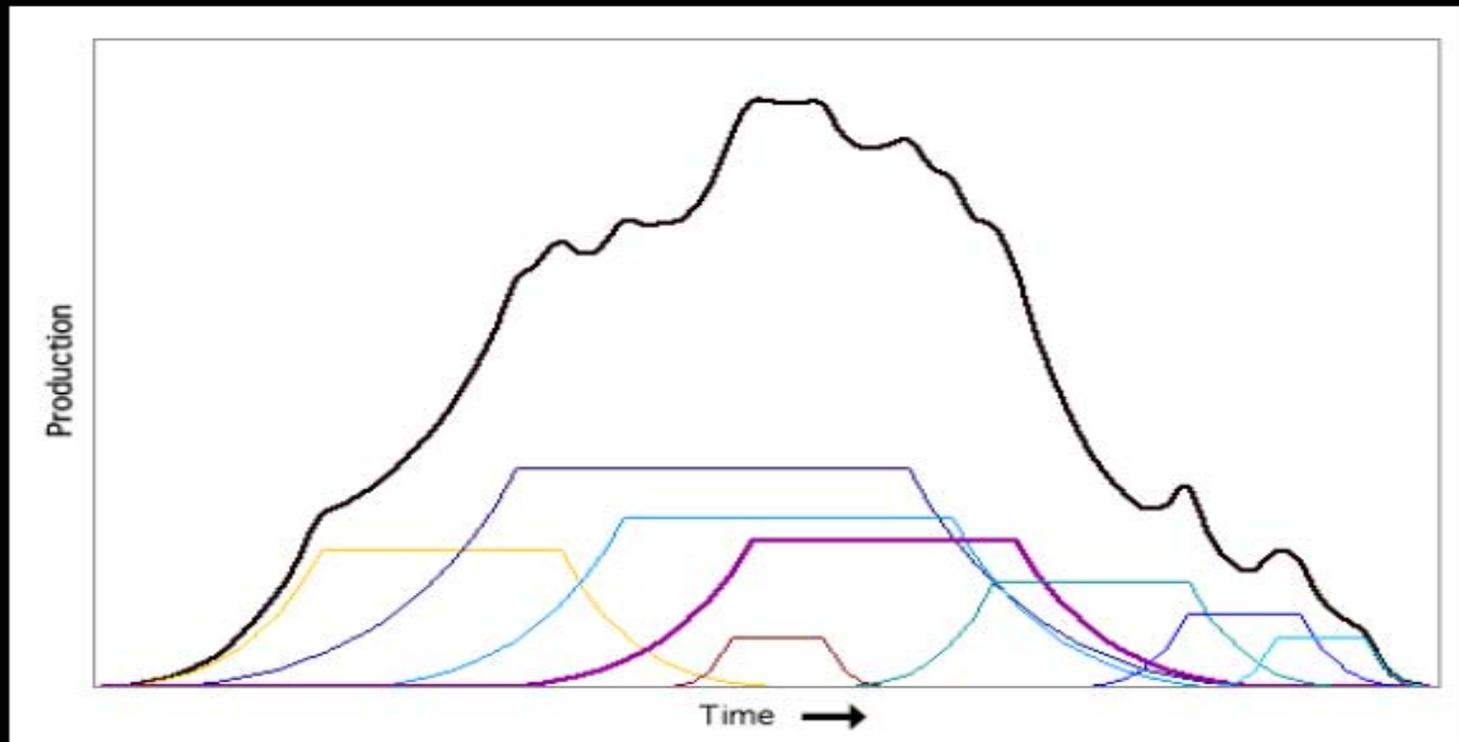
History of an individual well.

Oil Price Spike: Result of Speculation or of Overall Concern about future supply?





Supply Challenges: Peak Oil Drilling of Oil Field



History of an oil field.

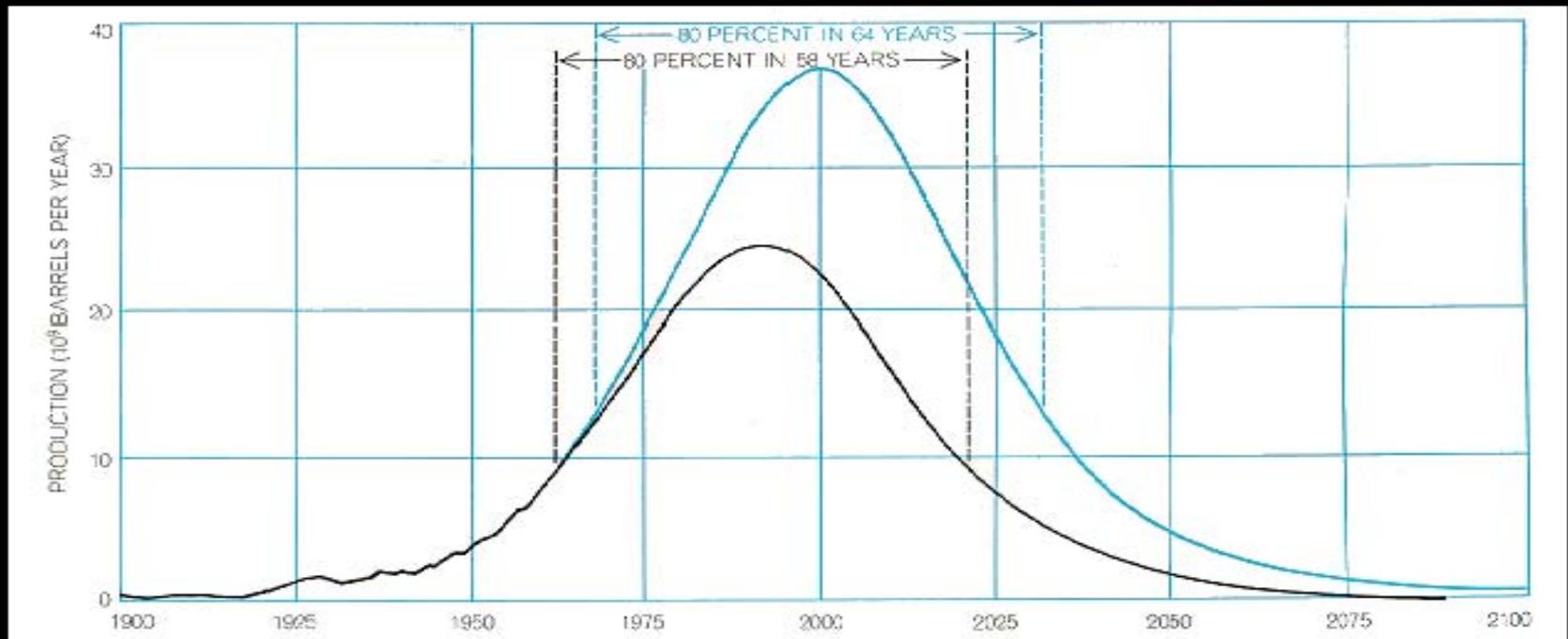
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Supply Challenges: Peak Oil

The Theory: The Hubbert Curve



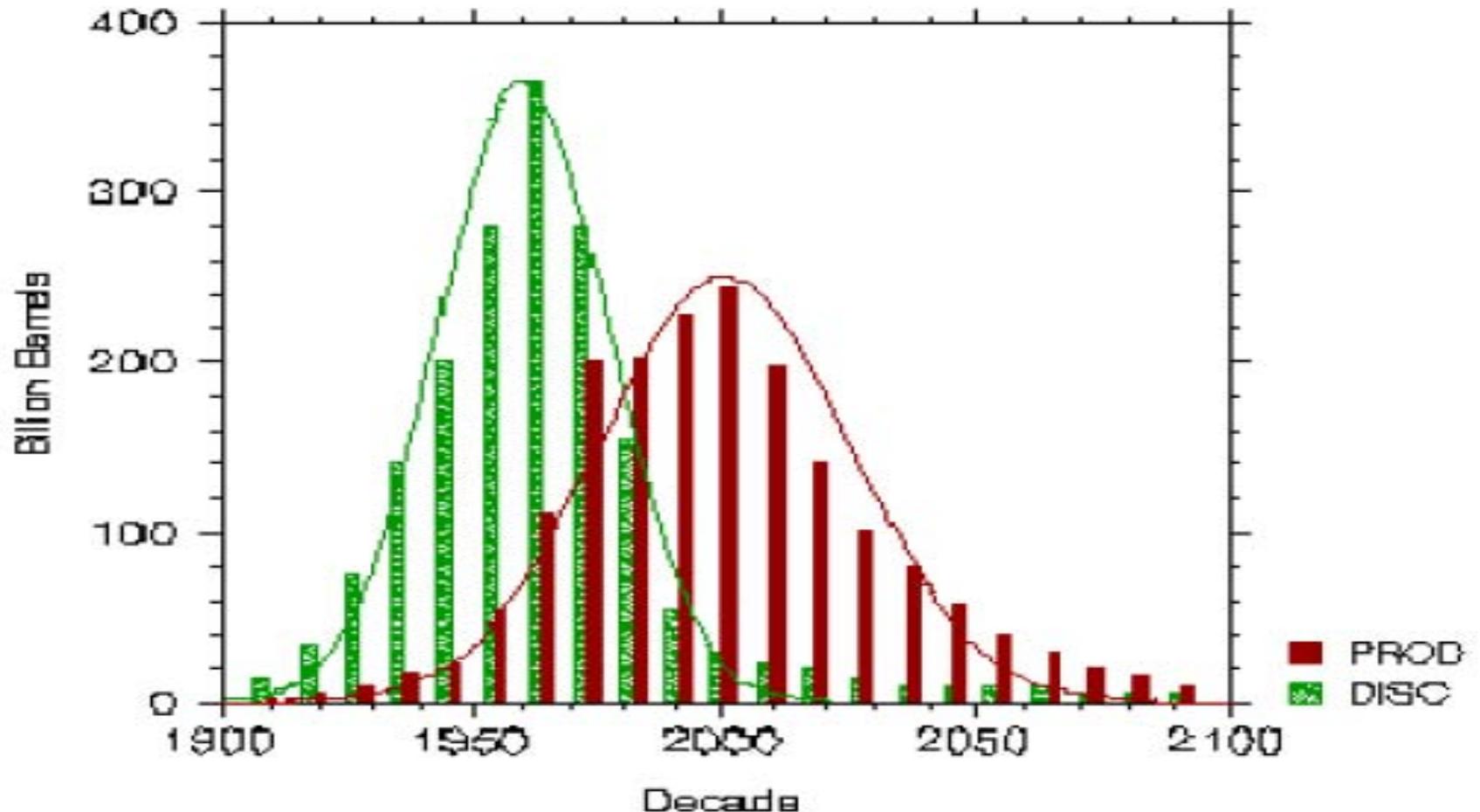
Hubbert Curve of oil production

Oil Price Spike: Result of Speculation or of Overall Concern about future supply?





Supply Challenges: Peak Oil Discovery and Production in Theory

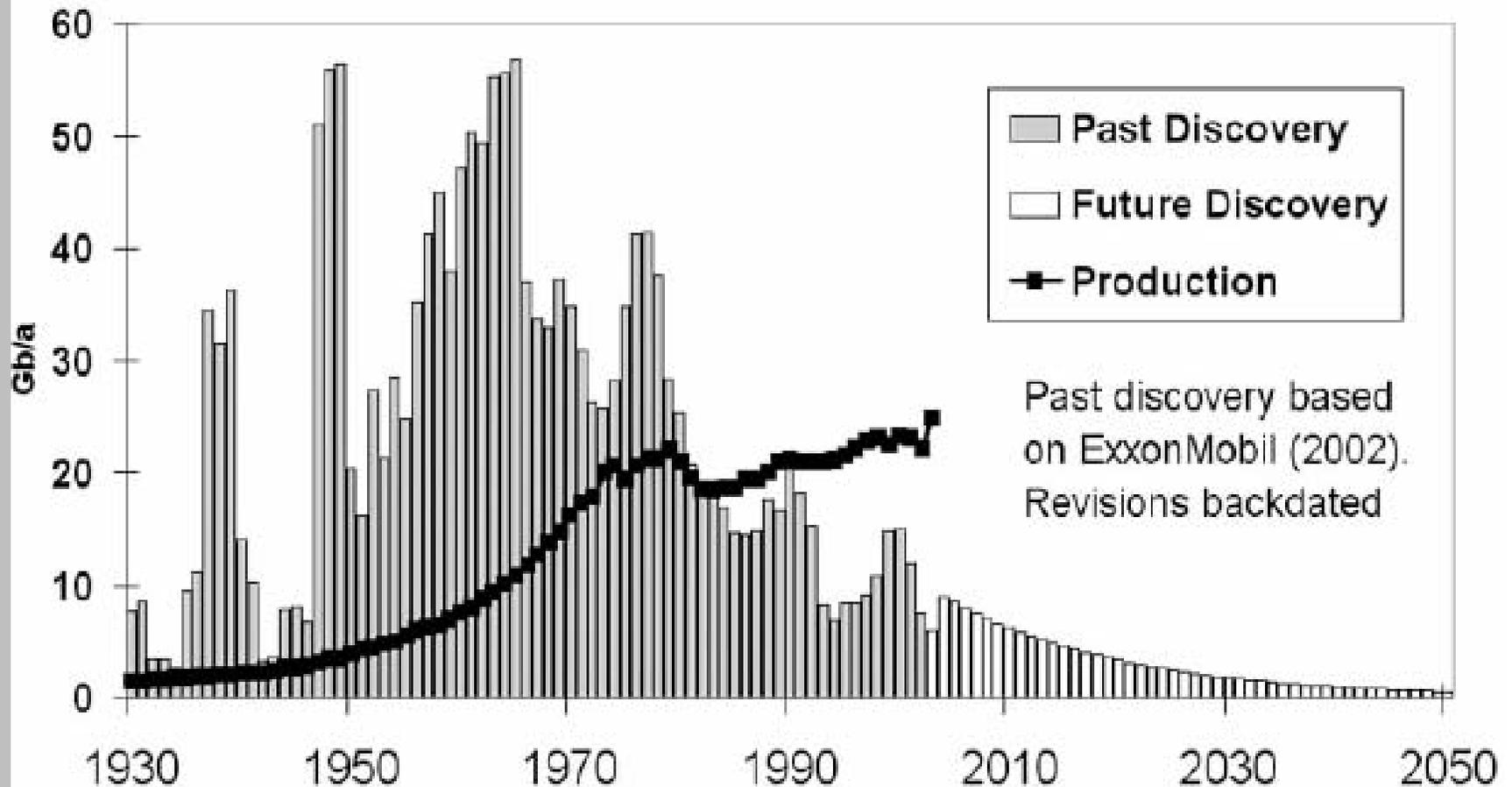


Oil Price Spike: Result of Speculation or of Overall Concern about future supply?





Supply Challenges: Peak Oil World Discovery and Production in Reality

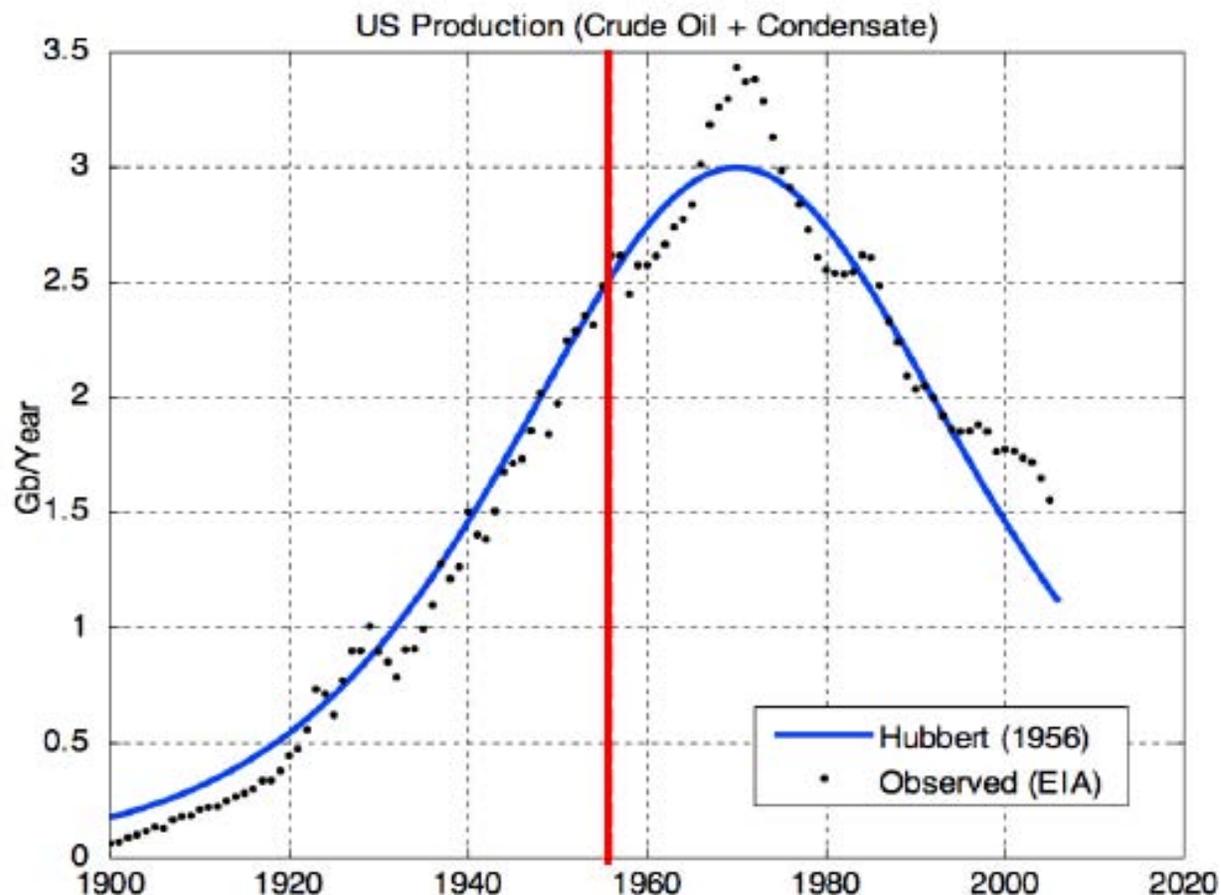


***Oil Price Spike: Result of Speculation or of
Overall Concern about future supply?***



Supply Challenges: Peak Oil

US Discovery and Production in Practice



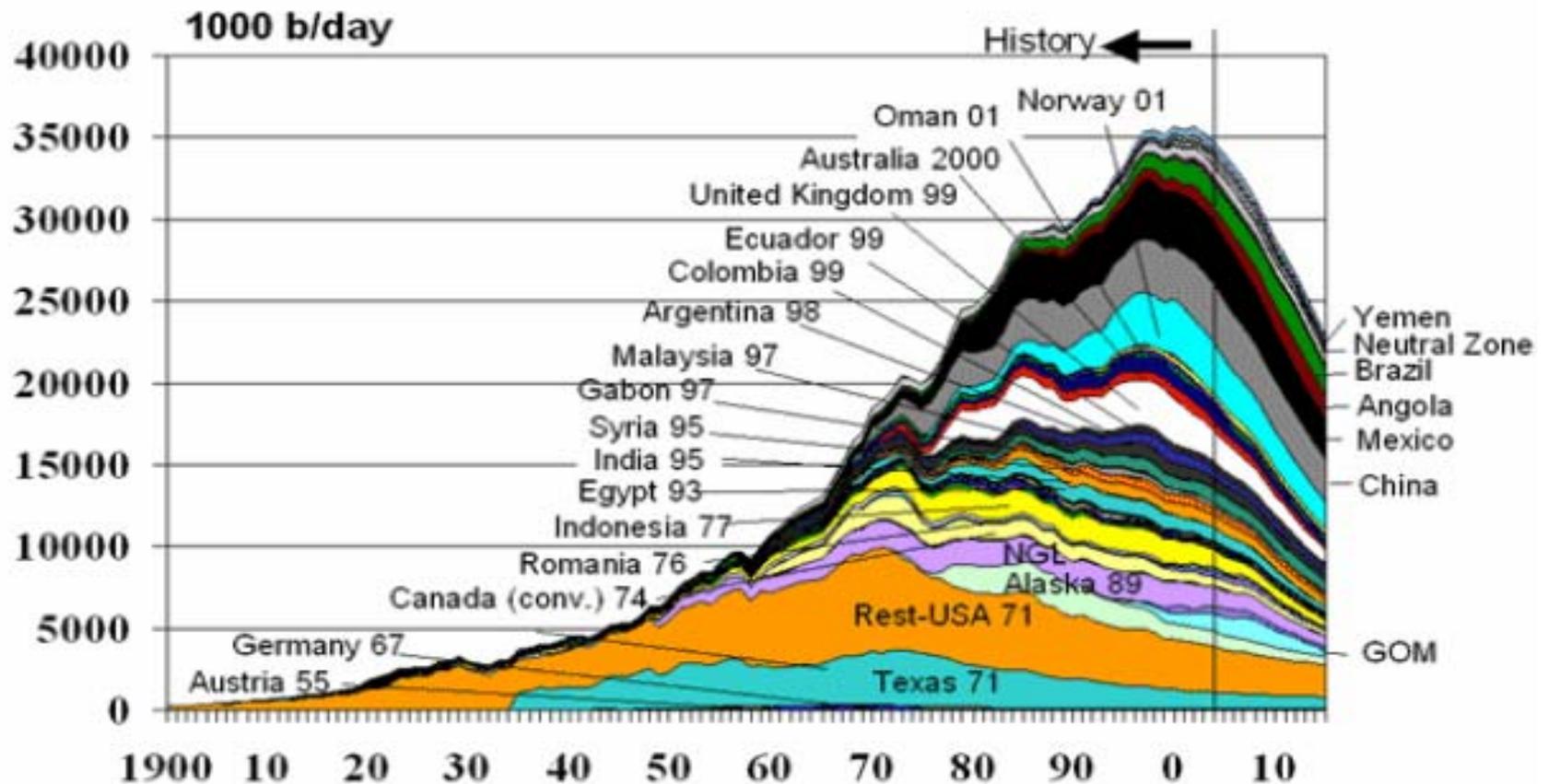
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Supply Challenges: Peak Oil

Most Oil Producers have Peaked



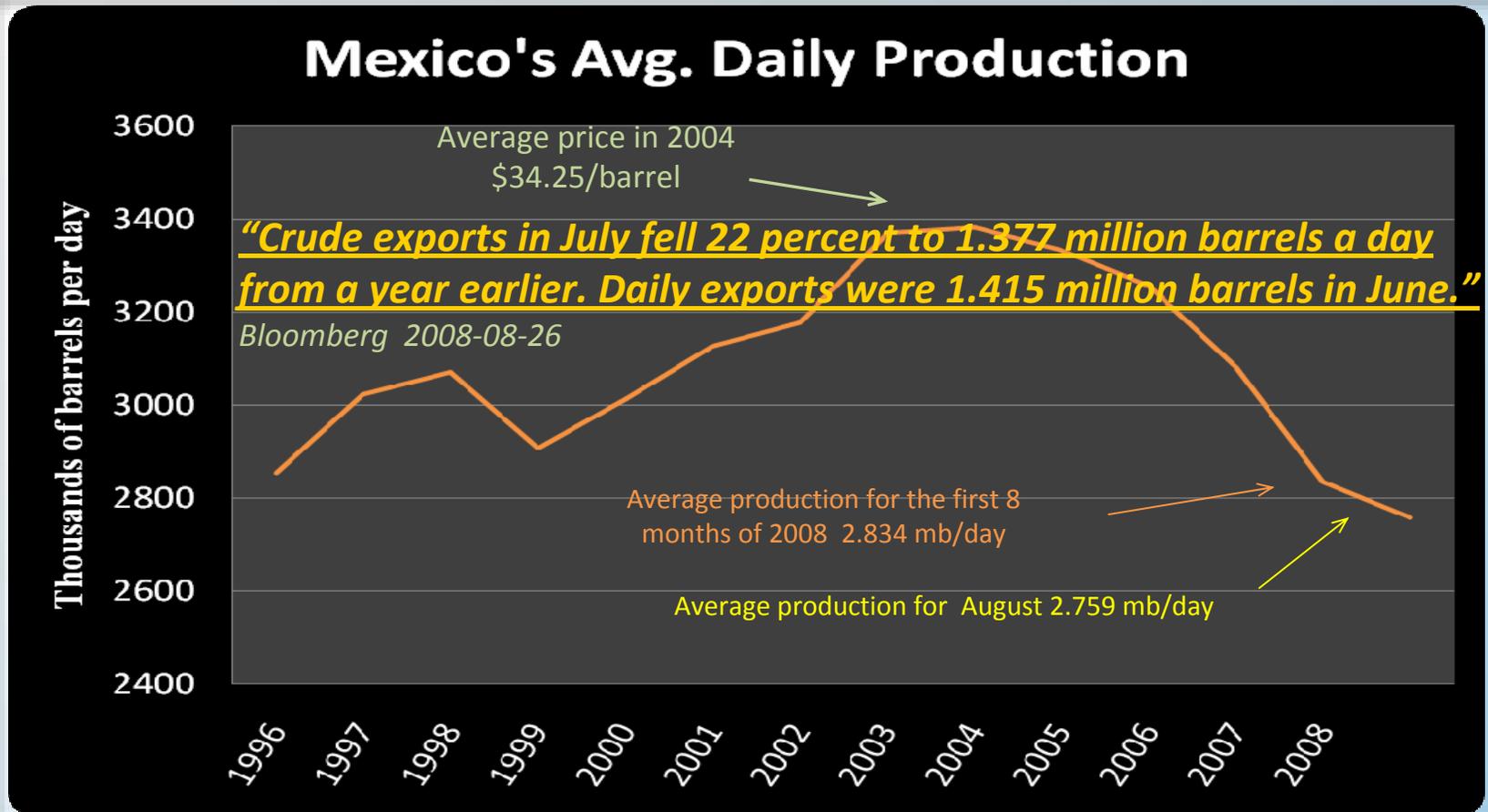
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Supply Challenges: Peak Oil

Example of Mexico



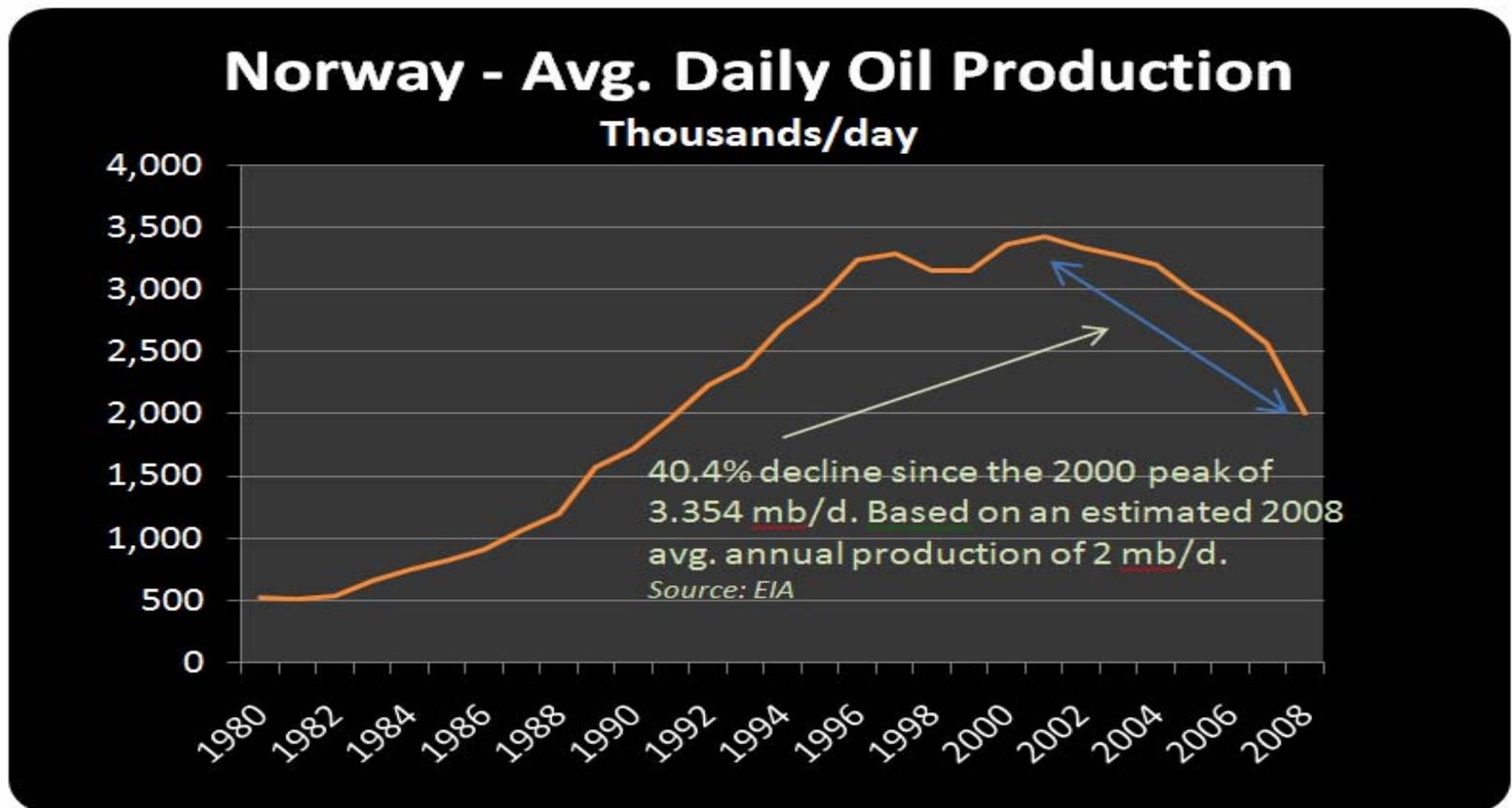
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Supply Challenges: Peak Oil

Example of Norway

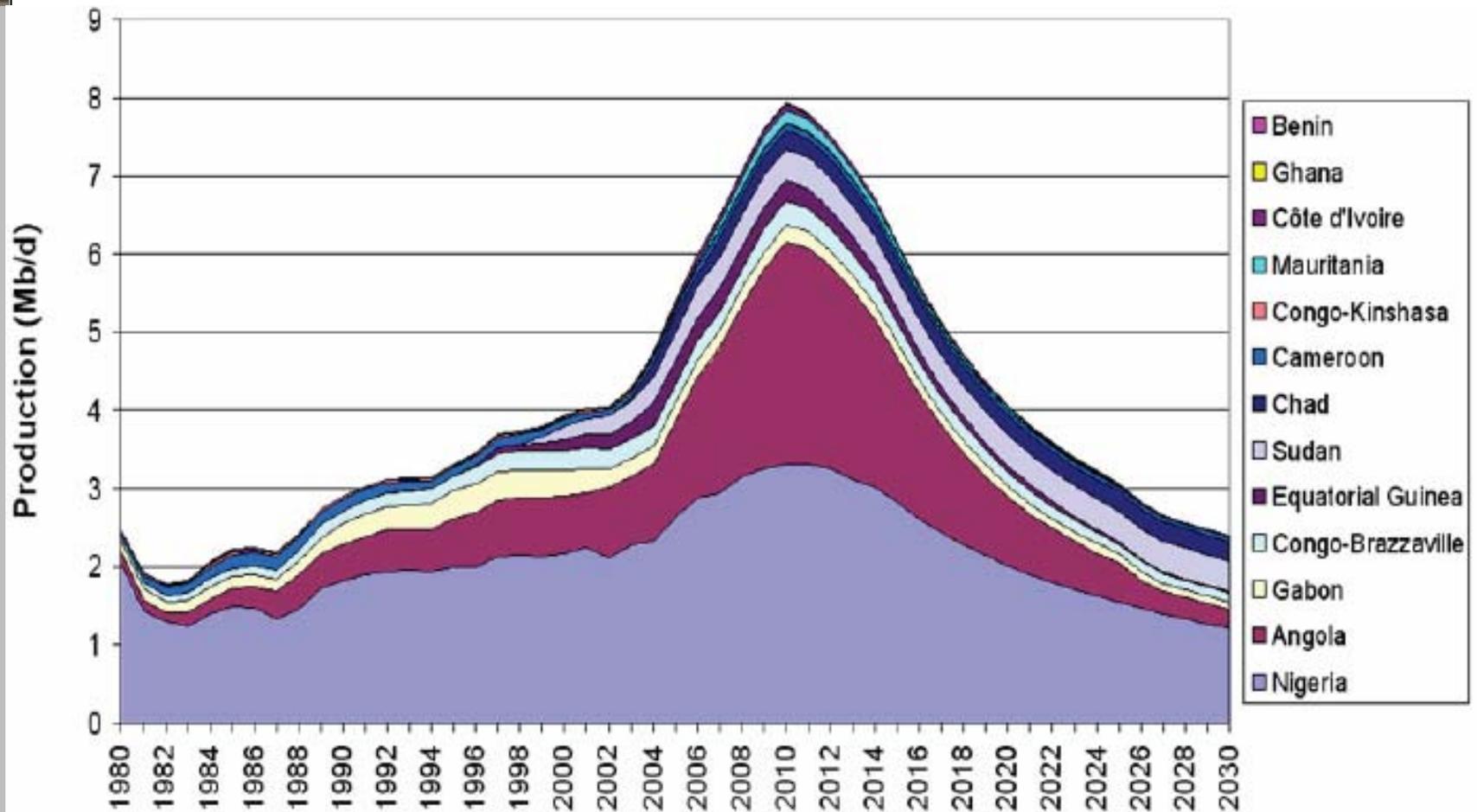


Oil Price Spike: Result of Speculation or of Overall Concern about future supply?



Supply Challenges: Peak Oil

Sub-Sahara Africa Peak



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?

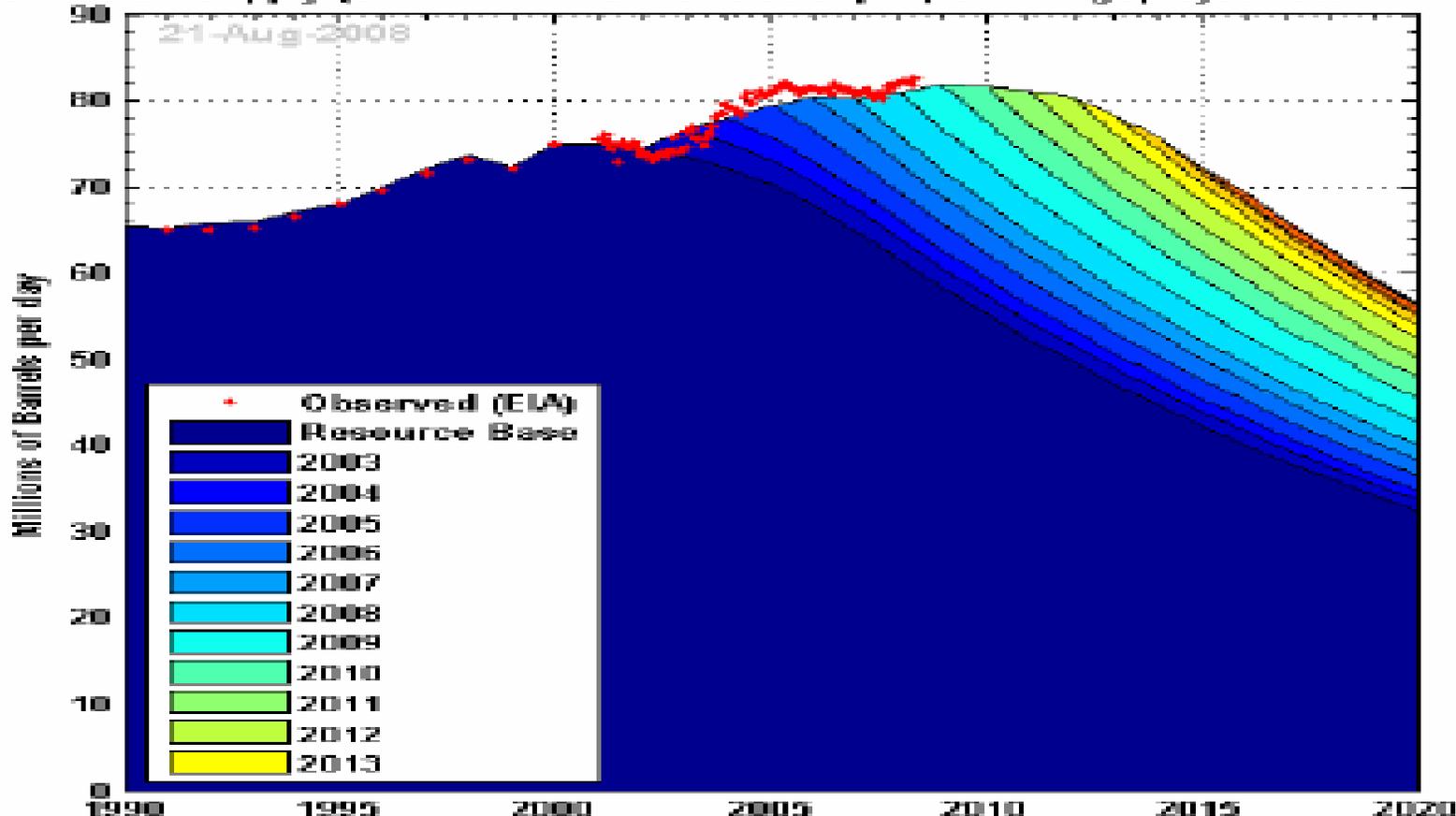




Supply Challenges: Peak Oil

Peak Estimate at 5.2% Depletion

World Oil Supply (Crude Oil + Natural Gas Liquid) and Megaproject Contributions



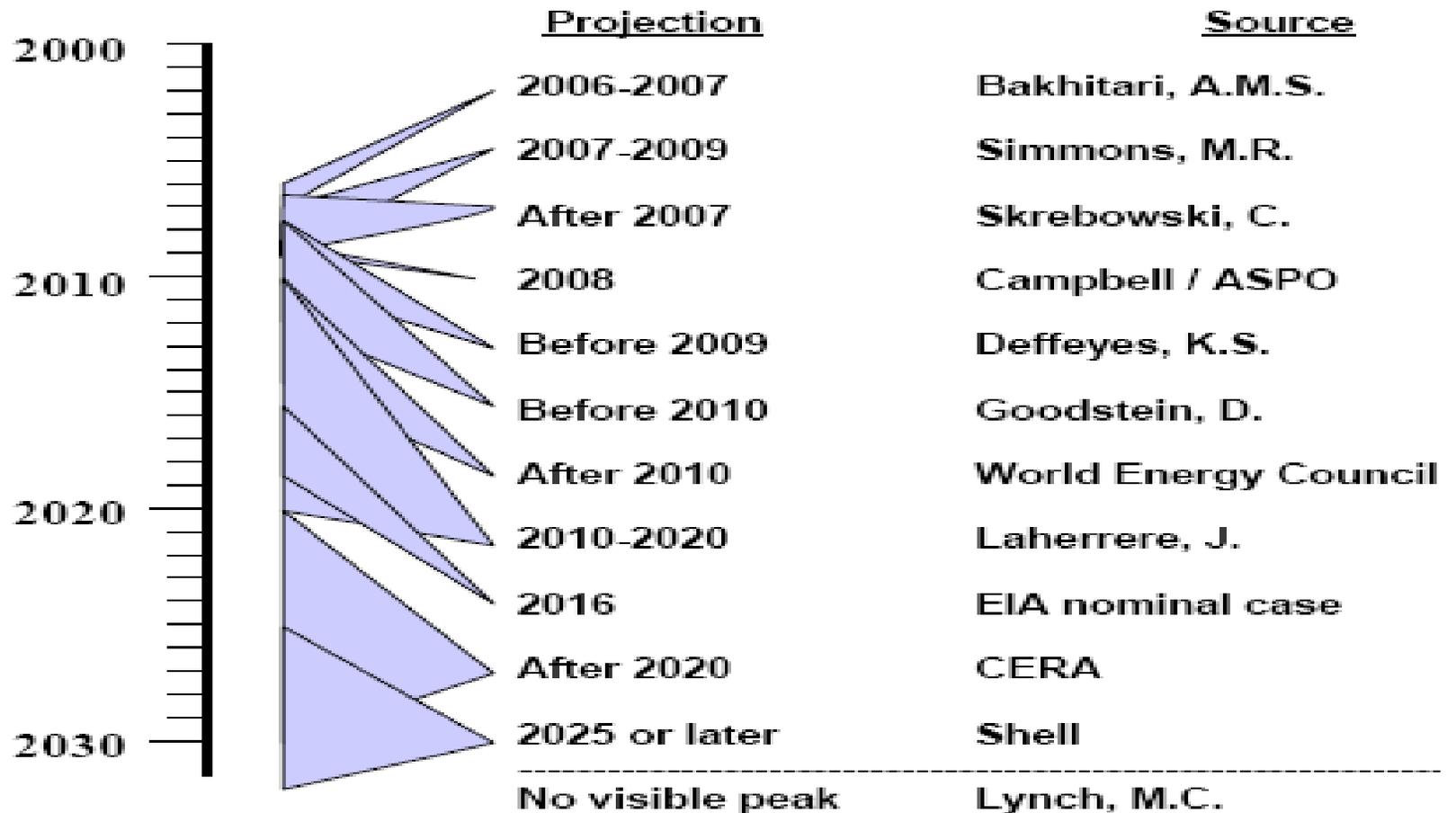
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Supply Challenges: Peak Oil

Various Forecasts



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?





Options for the Future

Oil Price Spike: Result of Speculation or of Overall Concern about future supply?

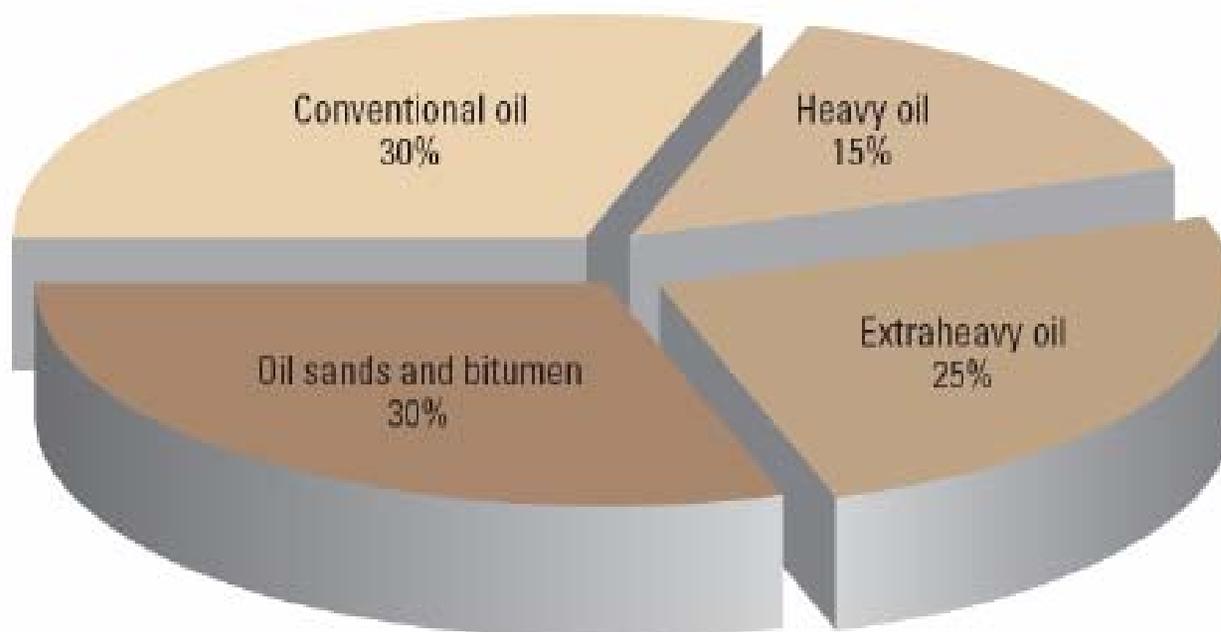




Options for the Future

Composition of Oil Reserves

Total World Oil Reserves



^ Total world oil reserves. Heavy oil, extraheavy oil and bitumen, make up about 70% of the world's total oil resources of 9 to 13 trillion bbl.



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?



Options for the Future

Heavy Oil & Oil Sands

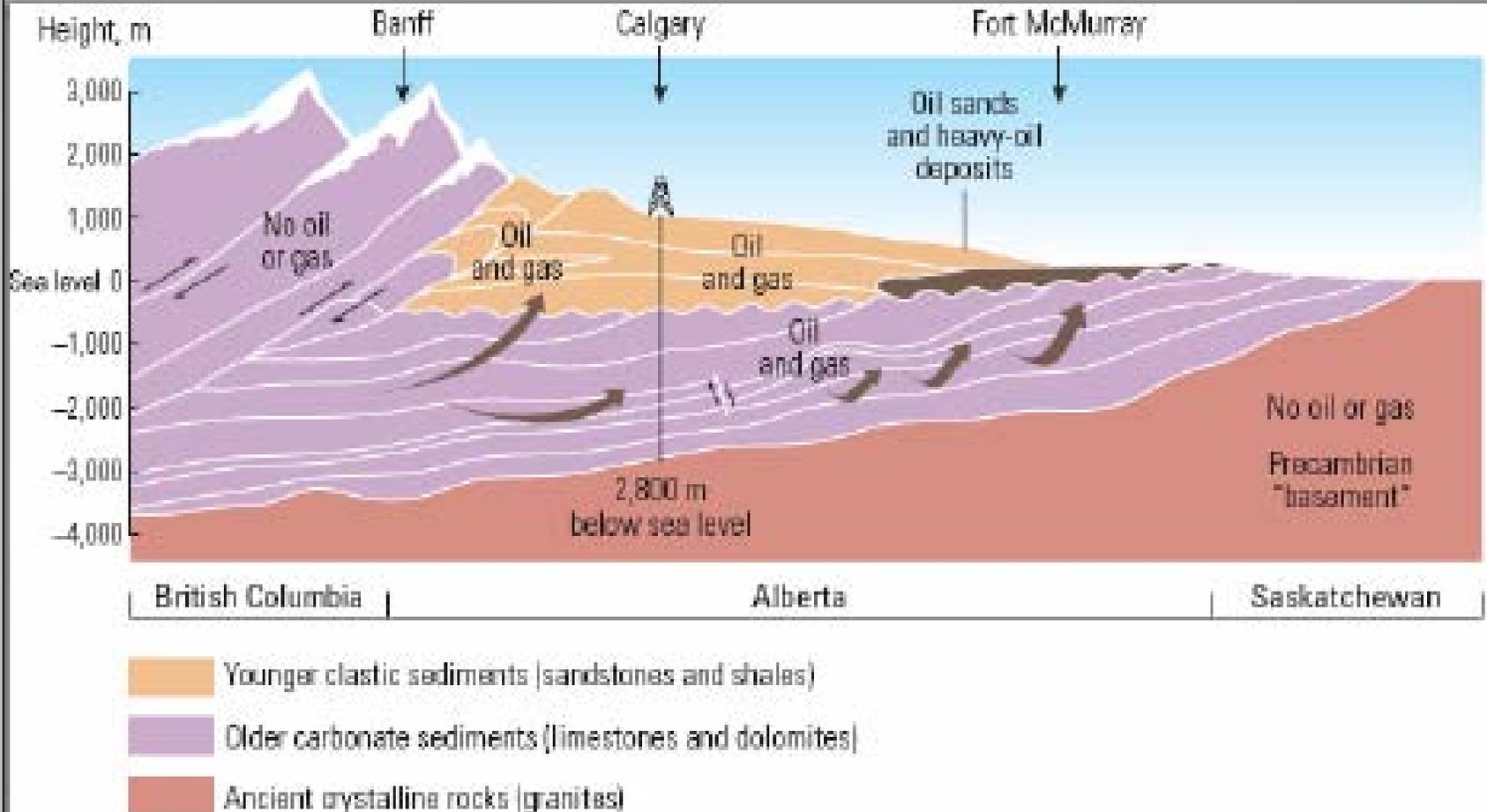


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Options for the Future

Largest Oil Sands Reserves in Canada



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?





Options for the Future

Heavy Oil & Oil Sands' Limitations

- ❖ **Canada currently produces 1 million barrel per day**
 - **Maximum 4-5 million**
 - **Major environmental constrains (water, energy, waste)**
- ❖ **Venezuela produced 54,000 bbd (1999), but sees potential for 500,000 barrels a day**

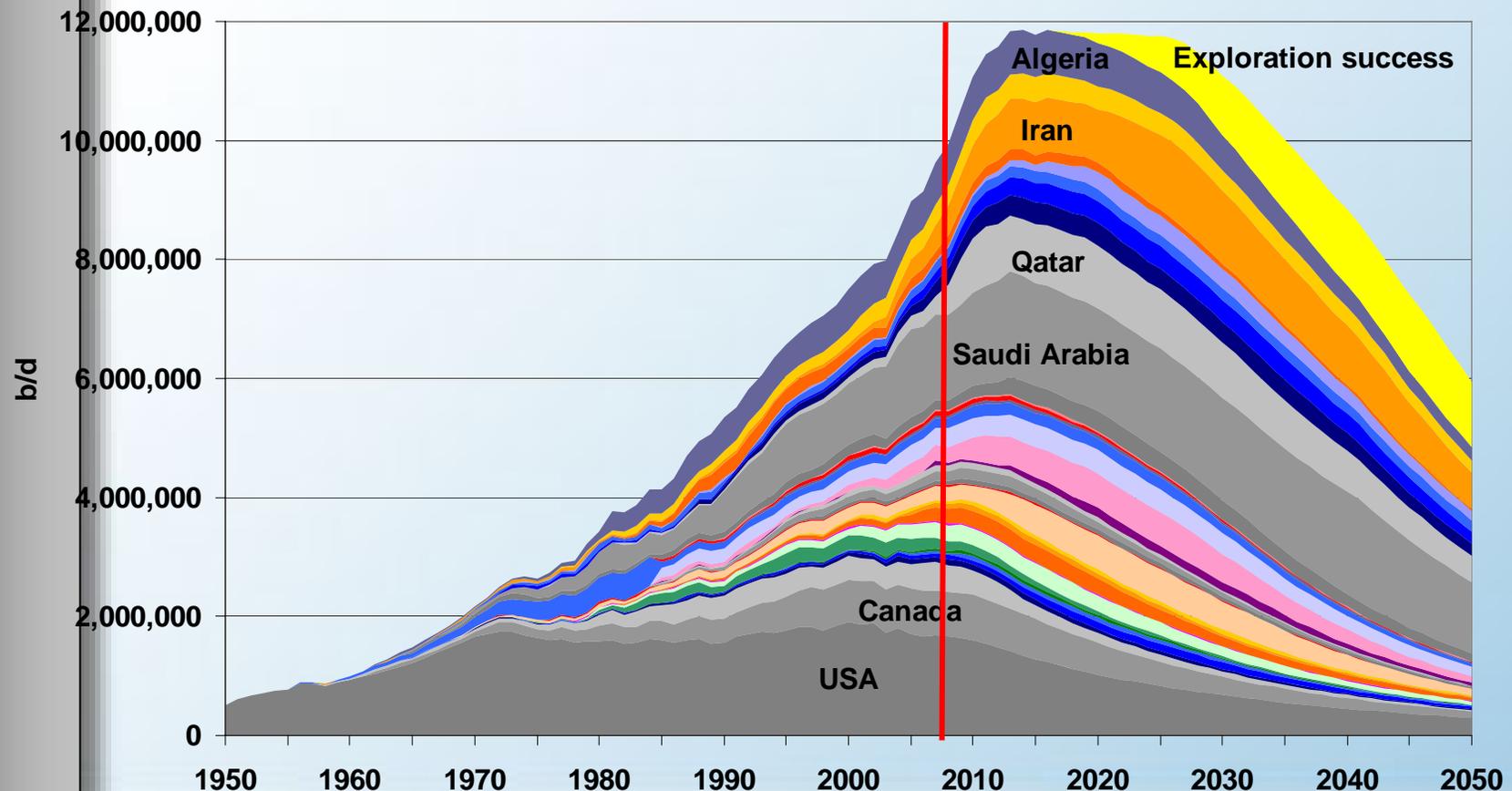


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Options for the Future

Natural Gas Liquids Peak



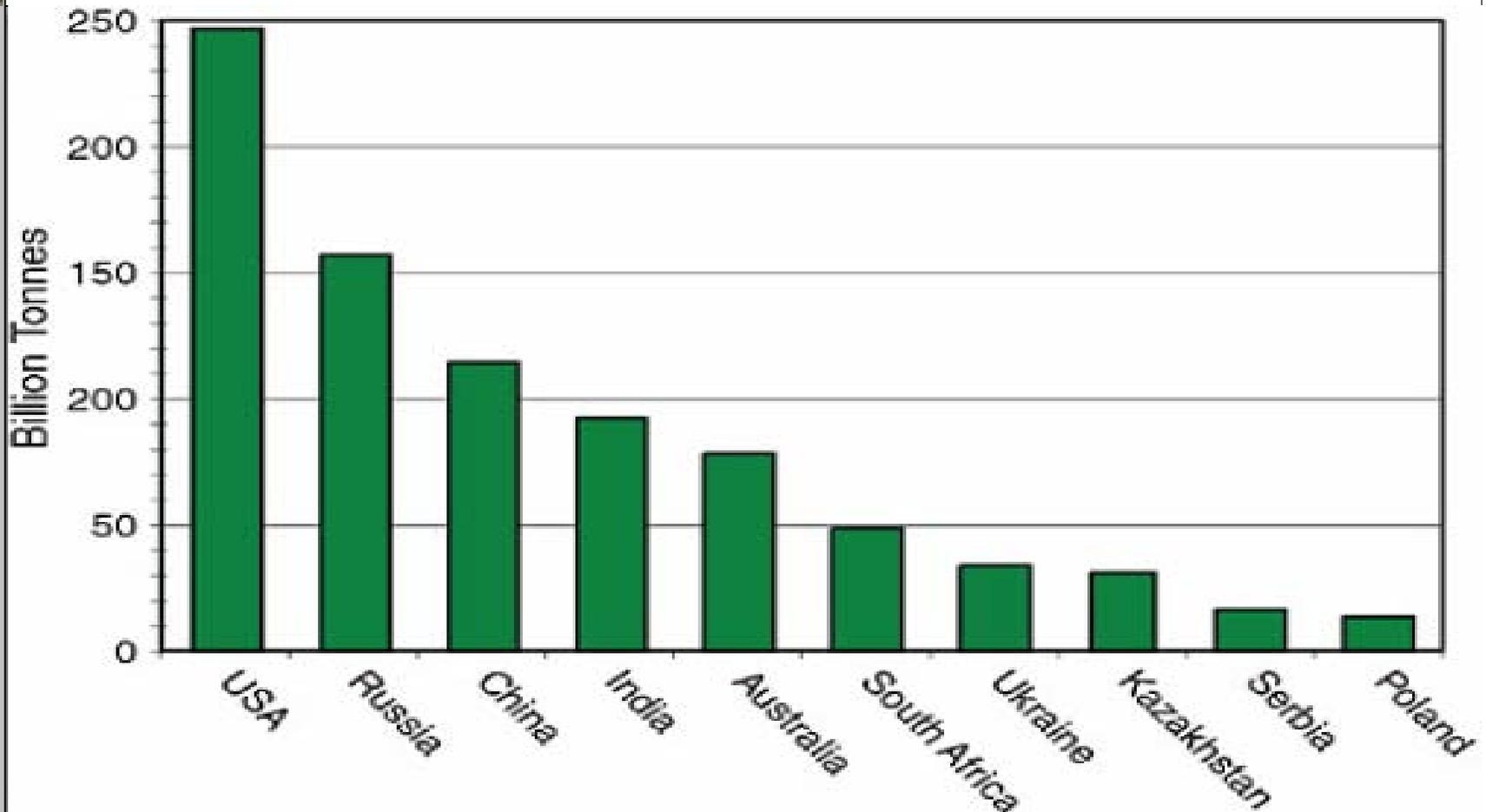
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Options for the Future

Coal to Liquids: Current Potential



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?



Options for the Future

Coal to Liquids - Limitations

- CTL is expensive, around US\$ 100 per barrel
- Coal mining has environmental implications (CO₂)
- CTL depends on large amount of water
- Energy balance (input versus energy in oil) is close to neutral

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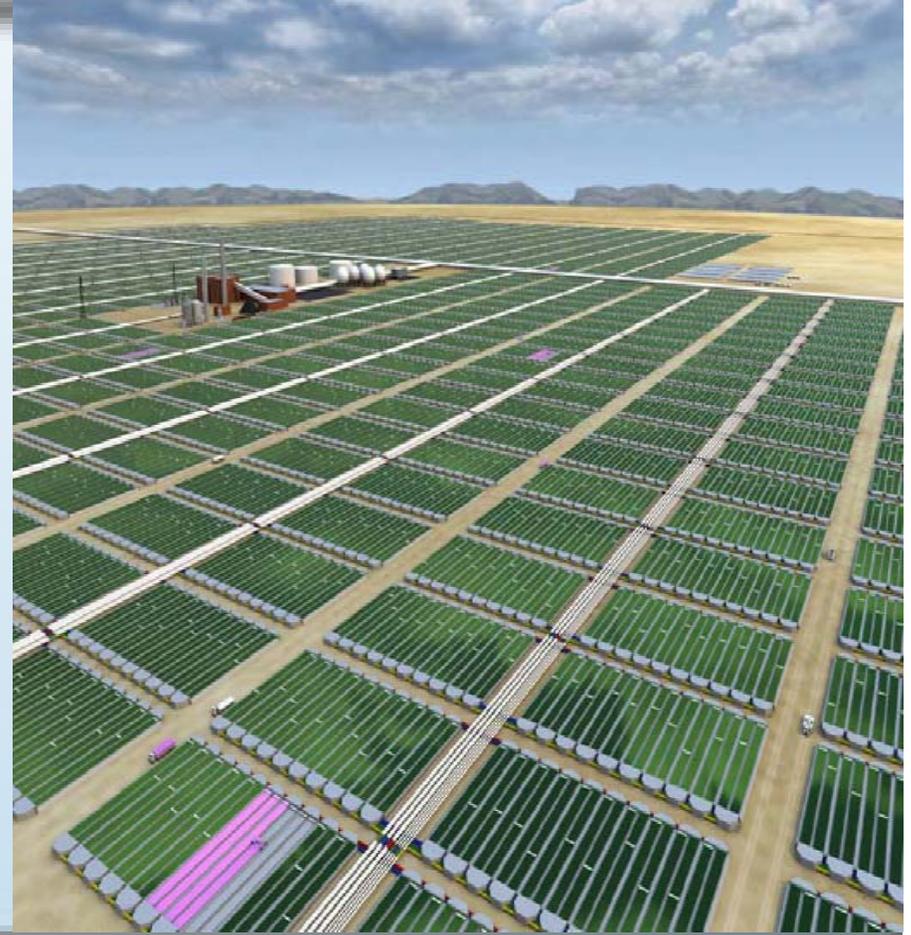




Options for the Future

Biofuels: Algae most probable

- **Algal Biodiesels could replace Jet Fuels**
- **Large area for infrastructure is needed**
- **High cost around US\$ 100 per barrel**
- **Terrain and time needed to produce**

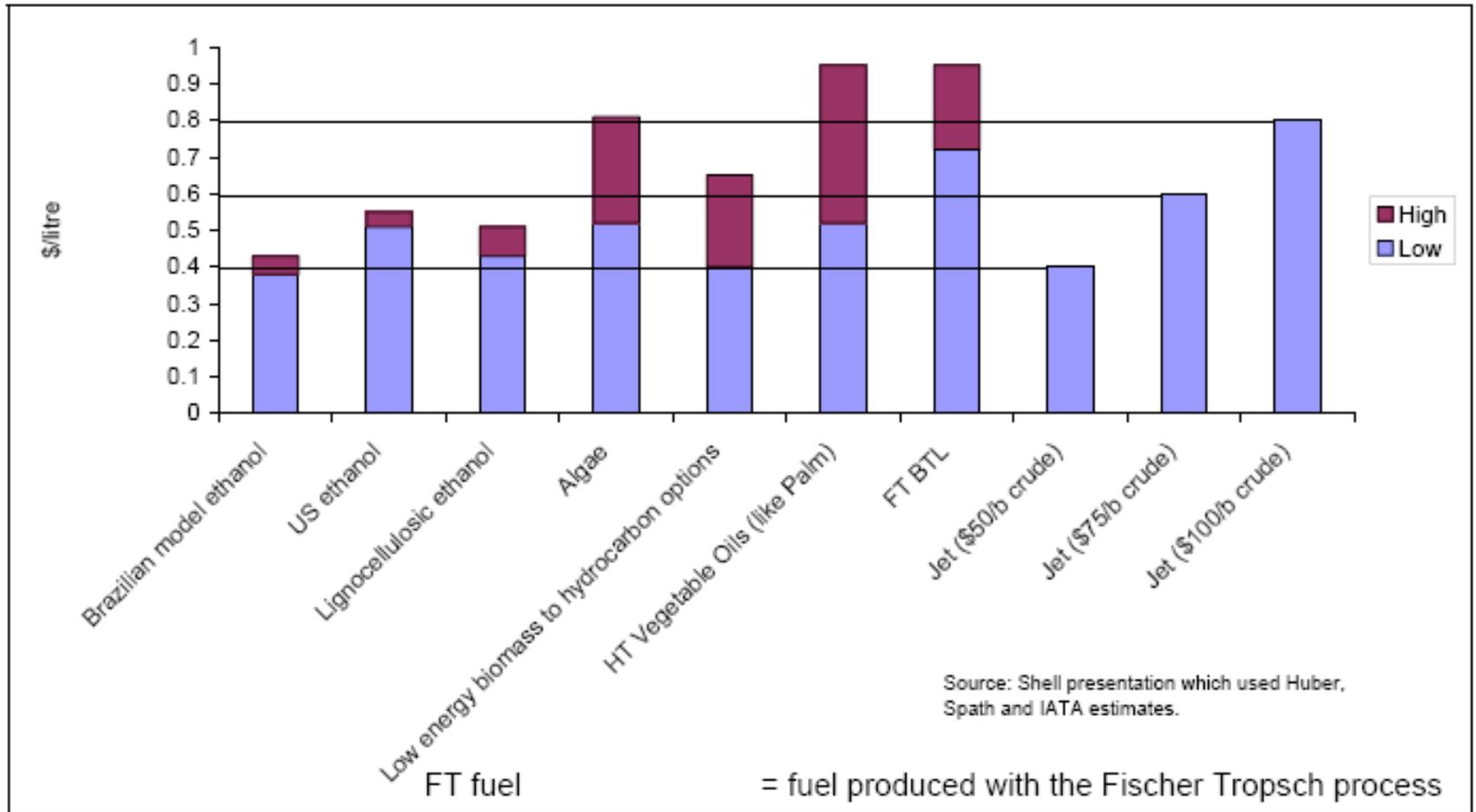


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Alternatives to Crude Oil

Biofuels: Cost of Jet Fuel Substitutes



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?



Alternatives to Crude Oil

Jet Biofuels in Practice

- Virgin Atlantic flew a Boeing 747-400 in early 2008 with one engine operating on a 20% biofuel mix of babassu oil and coconut oil.
- Air New Zealand will fly a Boeing 747-400 with one of four engines on a biofuel/kerosene mix in 2008/2009.
- Continental Airlines will fly a Boeing 737 on 3rd generation biofuel in 2009.

Oil Price Spike: Result of Speculation or of Overall Concern about future supply?





Options for the Future

- Do nothing, the market will regulate!
- Improve efficiency and lower consumption
- Global approach towards a new model of energy consumption, for example:
 - ✓ Move electric generating capacity from natural gas to coal
 - ✓ Move natural gas to power surface transportation
 - ✓ Remaining oil is dedicated for aviation



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?



Options for the Future

If we consider the spike was not a faulty indicator, the airline industry must act now:

1. Lobby for a global transparent assessment of remaining oil supply
2. Demand and support a global new energy plan



Oil Price Spike: Result of Speculation or of Overall Concern about future supply?