



The International Oil Market

A paradigm shift

Presentation by Anthony D Owen
Reserve Bank of Australia, 10 May 2006

www.ceem.unsw.edu.au



The Market in 2004

- Surplus production capacity dropped sharply as a result of a sharp increase in the rate of growth of demand and failure of Iraq to make a significant impact on supply.
- Growth = 2.6 mb/day (annual average about 1 mb/day since 1990)
- In October 2004 surplus capacity dropped below 1 Mb/day.
- Prices broke through \$50.
- Historically high utilisation rates at refineries worldwide.
- Very high sulphur heavy crudes at margin.



The Market in 2005

- Rate of growth of demand fell back to its average over the past two decades.
- Significant reductions in oil subsidies in Asia.
- OPEC quotas raised by 15%.
- Hurricane Katrina reduces US refining capacity.
- Supply disruptions in Nigeria, Iraq, Ven.
- OECD oil stocks down to 15-year low.
- Prices passed \$70 in September 2005.



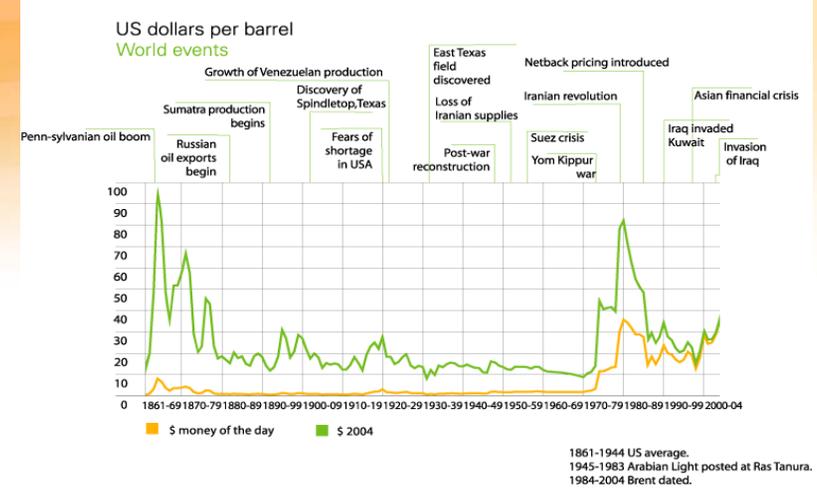
The Market today

- OECD oil stocks have increased.
- Capacity constraints facing all producers.
- Persistent supply disruptions continue.
- Iran nuclear stance.
- High oil prices reducing demand growth.
- Pricing issues in Asia.
- Long-term incremental cost of supply of \$20-22/bbl now perceived to be over \$30/bbl for non-OPEC supply.

Projected demand

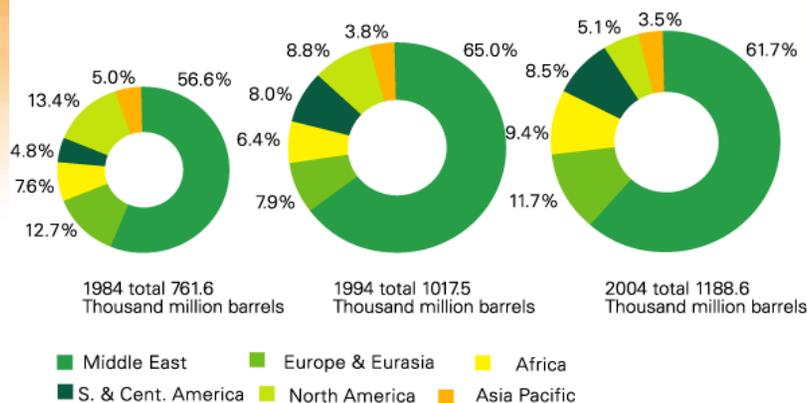
- Consumption (2004): 30 billion barrels
- IEA projected growth to 2030: 1.6% p.a. or about 1 trillion barrels cumulative.
- Cumulative production to date: about 1 trillion barrels

Crude oil prices since 1861 (Source: BP)



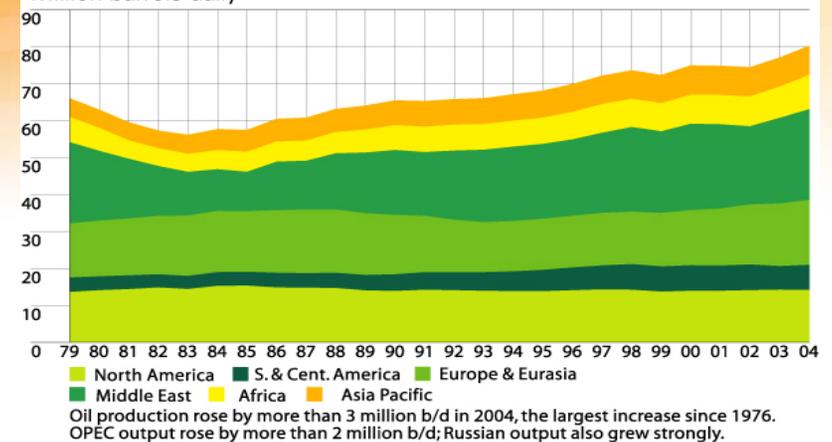
Distribution of proved oil reserves (Source: BP)

Percentage

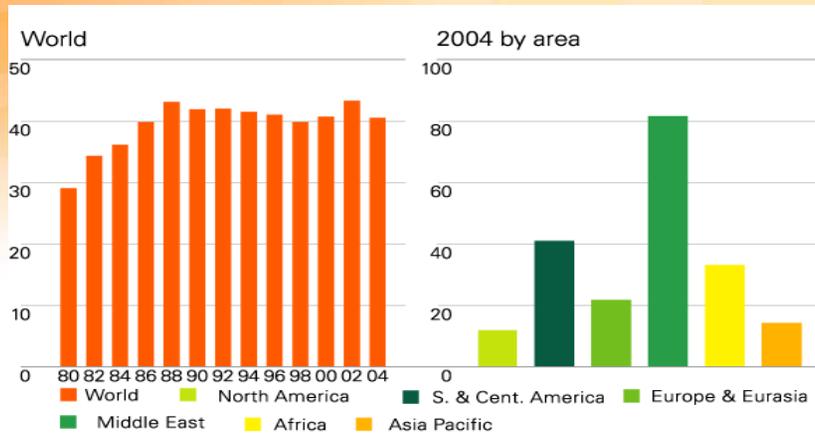


Oil production by area (Source: BP)

Million barrels daily

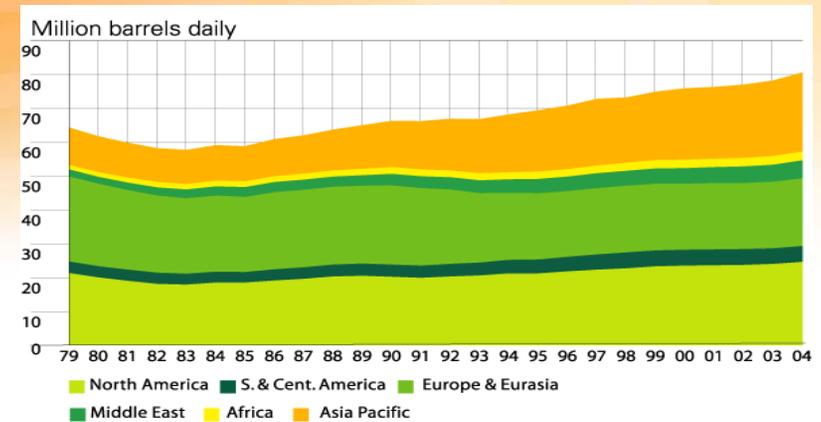


Oil reserves to production ratios (Source: BP)



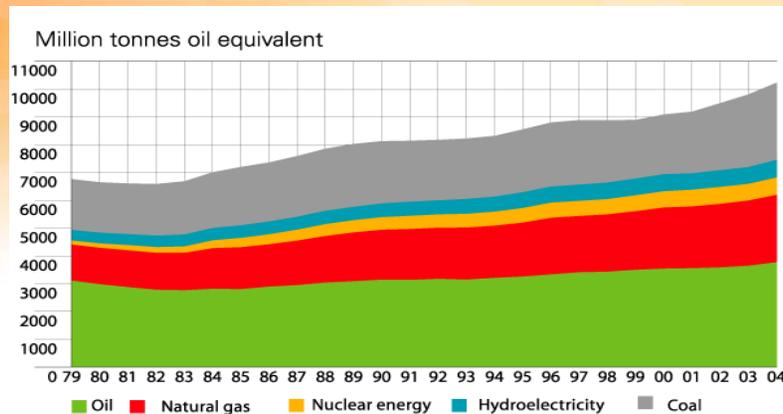
The world's oil reserves-to-production ratio fell to 40.5 years in 2004, down from 43.3 in 2002. Reserves have continued to increase and now stand 17% above the 1994 level; production is 20% higher.

Oil consumption by area (Source: BP)



The rate of world oil consumption growth was the strongest since 1978. Growth was above the 10-year average in every region. Asia Pacific has accounted for 50% of global growth over the past decade.

World primary energy consumption (Source: BP)



Global primary energy consumption recorded the strongest incremental growth ever, rising by 4.3%. Growth was above the 10-year average in all regions and for all fuels.

Major problems: ignorance & uncertainty

- Over-reliance on Saudi Arabian production
- Saudi Aramco, Saudi Arabia's state-owned oil company, has not provided production data for more than two decades!
- Last verified proven Saudi reserve assessment was in 1979
- ¾ of incremental demand supplied from ME
- Is the Saudi oil industry in "twilight" mode (as Matt Simmons contends), or can it expand productive capacity significantly (as Saudi Oil Ministers contend)?

- Is market so distorted that reliable information required for efficient decision making by both oil producers & consumers is absent?
- Oil price increases are not bad *per se*, price volatility based upon uncertainty is the problem.
- If a rising oil price is perceived to be a long-term phenomenon, then investment in alternative technologies would be encouraged.
- Typically US\$20-\$22/b still perceived as appropriate price for investment decisions. \$35/b would produce some interesting options!
- New technologies must minimise their environmental footprint!

Conventional/non-conventional oil

Definitions by no means universally agreed, but:

Conventional

- All oils having a specific gravity between 20° and 50° API

Non-Conventional

- Heavy oil & bitumen
- Oil shales & oil sands
- CTL and GTL technologies

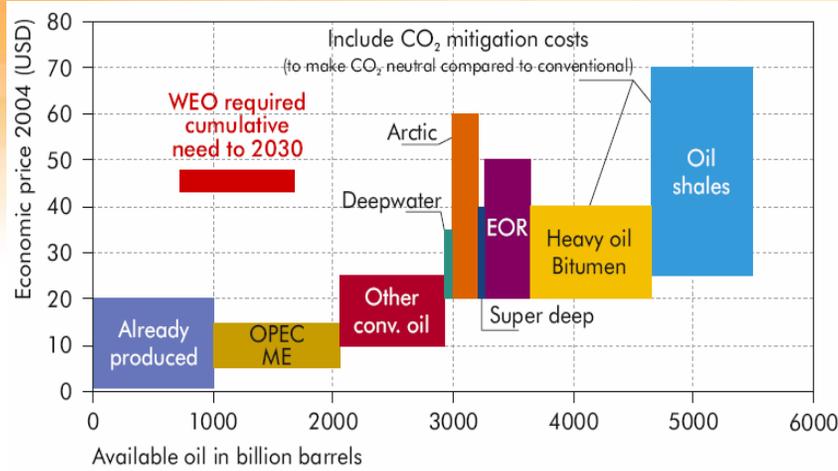
New conventional sources

- **Deepwater**
2000-3500 metres (currently Gulf of Mexico, offshore W. Africa and offshore Brazil)
- **Arctic**
- **Super-deep reservoirs**
4000+ metres (e.g. North Sea's Elgin-Franklin is 6000 metres below the seabed)

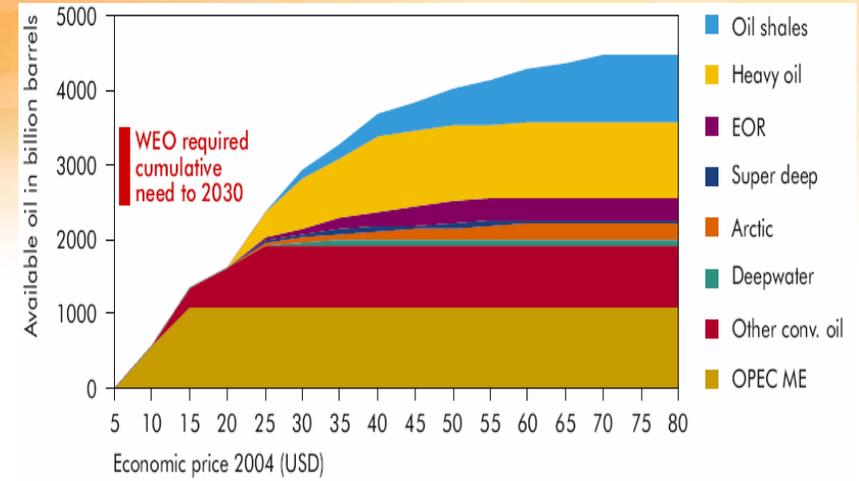
Potential unconventional sources of supply

- **Heavy oil, bitumen and oil sands**
Large deposits in Canada, Russia, and Venezuela (recovery is highly capital intensive)
Potentially massive (4 trillion barrels in Canada and Venezuela alone: at 20% recovery these reserves outnumber all of those in the ME).
- **Oil shales**
Worldwide reserves 2.6 trillion boe.

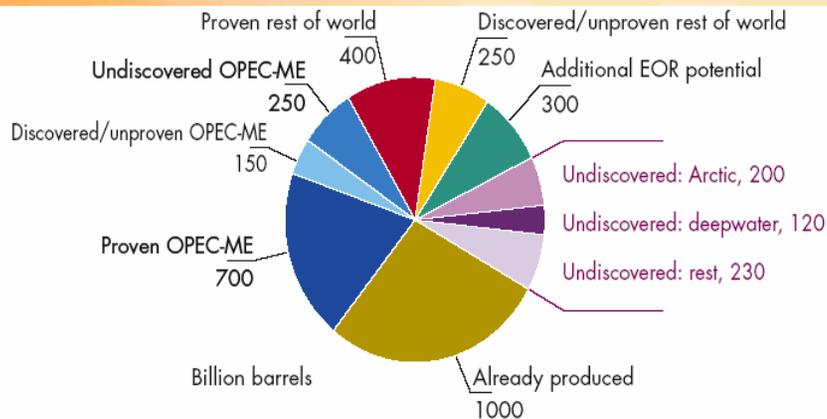
Oil cost curve, including technological progress: availability of oil resources as a function of economic price (Source: IEA)



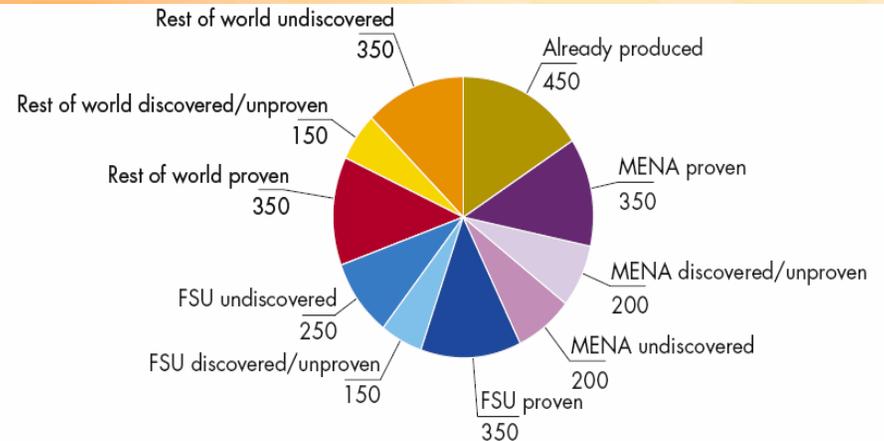
Oil cost curve: alternative presentation (Source: IEA)



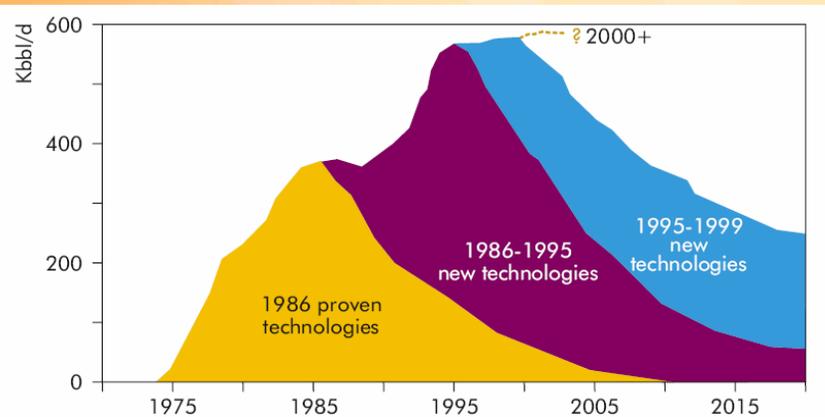
World ultimately recoverable conventional oil (Source: USGS & IEA)



World ultimately recoverable conventional gas: billion barrels oil equivalent (Source: USGS, Cedigaz, & IEA)



Impact of technology on production from the North Sea in thousand barrels per day (Source: Shell)



Economics approach: do current crude oil prices reflect market fundamentals?

- OPEC: 40% of supply; 70% of proven reserves
- OPEC has acted in the past as the marginal supplier to “balance” the market
- Non-OPEC suppliers act as price takers
- When demand is close to productive capacity, OPEC’s ability to reduce prices is limited
- Current price-output configuration appears to be a short-run competitive equilibrium
- Crude oil price increases of 2004 largely explained by the unexpected rapid growth in consumption

- Crude oil price increases of 2005 largely reflect the uncertain environment and expectations of future market tightness in production capacity
- The perception of a limited response of investment to higher prices has reinforced these expectations
- Data problems with non-OECD countries in relation to supply, stocks & exports
- Refinery bottlenecks have raised product margins

Why the lack of investment?

- Are 2004/2005 oil price levels a short-term phenomenon (lessons of past decades)?
- Middle East reserves dominate market sentiment
- Uncertainties about size of ME reserves and cost of developing them
- Saudi Arabia oil sector closed to foreign investment
- Many countries have highly regulated oil sector.
- Many bottlenecks throughout the oil cycle contributing towards higher prices
- Shareholder expectations (short-term)
- Low refinery margins until recently

World Energy Outlook 2005 IEA projections to 2030

- World energy demand to increase 50% (bau); 37% (env. policy)
- Cumulative investment of \$17 trillion required to ensure supply (\$3 trillion for oil, and equivalent to twice the annual amount spent over the past decade)
- Greater dependence on Middle East and North Africa (MENA) for oil and gas supplies
- Energy-related CO₂ emissions to rise by 52% (bau)
- Oil (2004) bau prices: \$35 (2010), \$39 (2030)
- Oil (2004) deferred investment: \$52 (2030)

The projected bau trends lead to a non-sustainable future, from both an energy-security and an environmental perspective

Implications for MENA oil exporters

- World oil demand to rise from 83 mb/d (2004) to 92 mb/d (2010) to 115 mb/d (2030)
- Oil production from MENA to rise from: 29 mb/d (2004) to 33 mb/d (2010) to 50 mb/d (2030)
- Oil production from Saudi Arabia to rise from: 10.4 mb/d (2004) to 11.9 mb/d (2010) to 18 mb/d (2030)
- Production increases also in Iraq, Kuwait, UAE & Libya
- Deferred investment scenario would lower requirements
- Is sufficient capital available for investment in oil exploration and oil production infrastructure?

Backstop technologies

Short-term technology

- Hybrid vehicles

Short-term fuels

- Methanol (environmental concerns – CO₂)
- GTL using stranded or associated gas (scale problems)
- Ethanol & biodiesel (scale problems)

Longer-term technology

- Battery vehicles
- Hydrogen/fuel cell vehicles

Thank You