

Korea Energy Economics Institute
2007 International Petroleum Workshop

MEDIUM-TERM **Oil Market Report**

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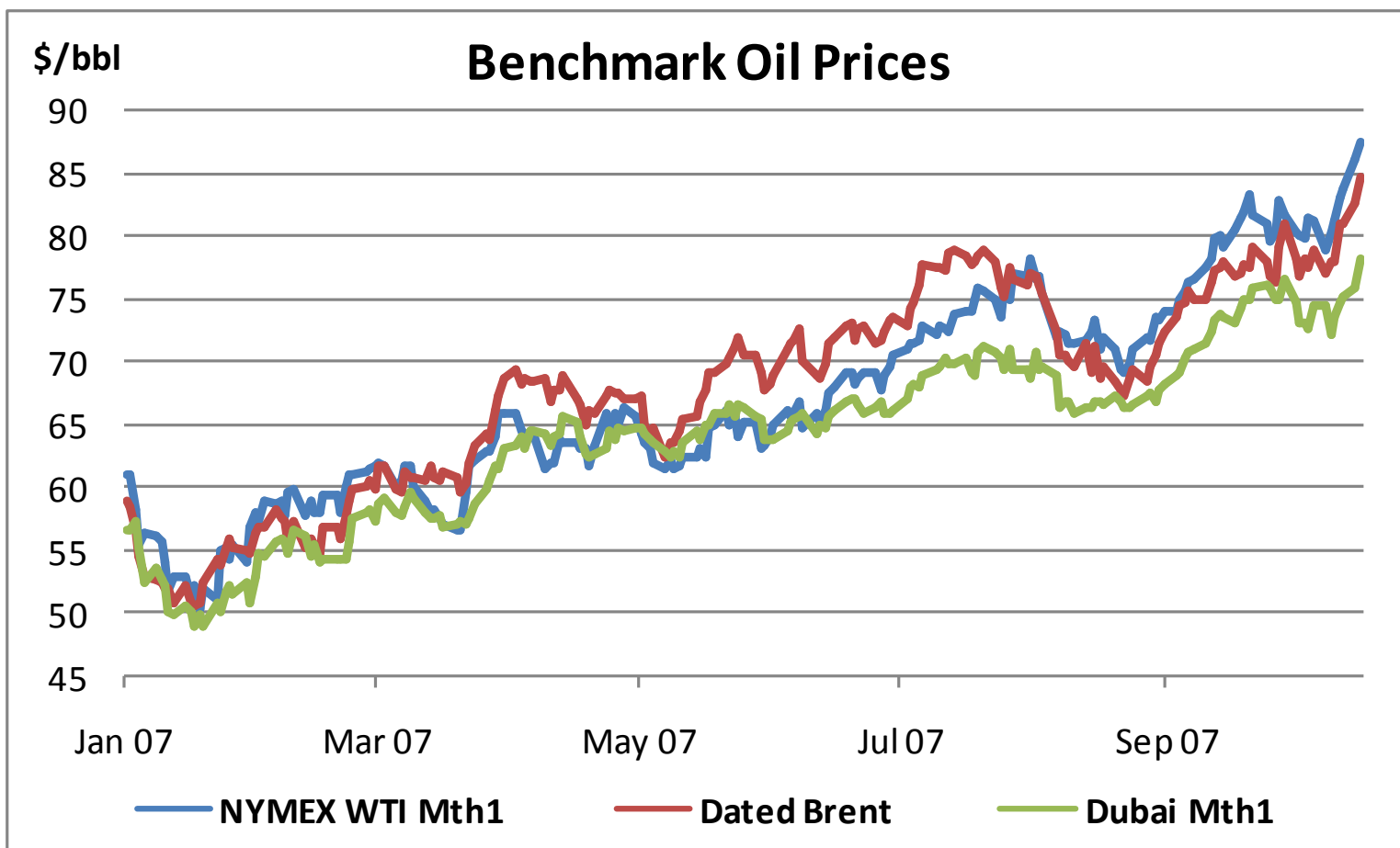
Seoul, 25 October 2007

www.oilmarketreport.org



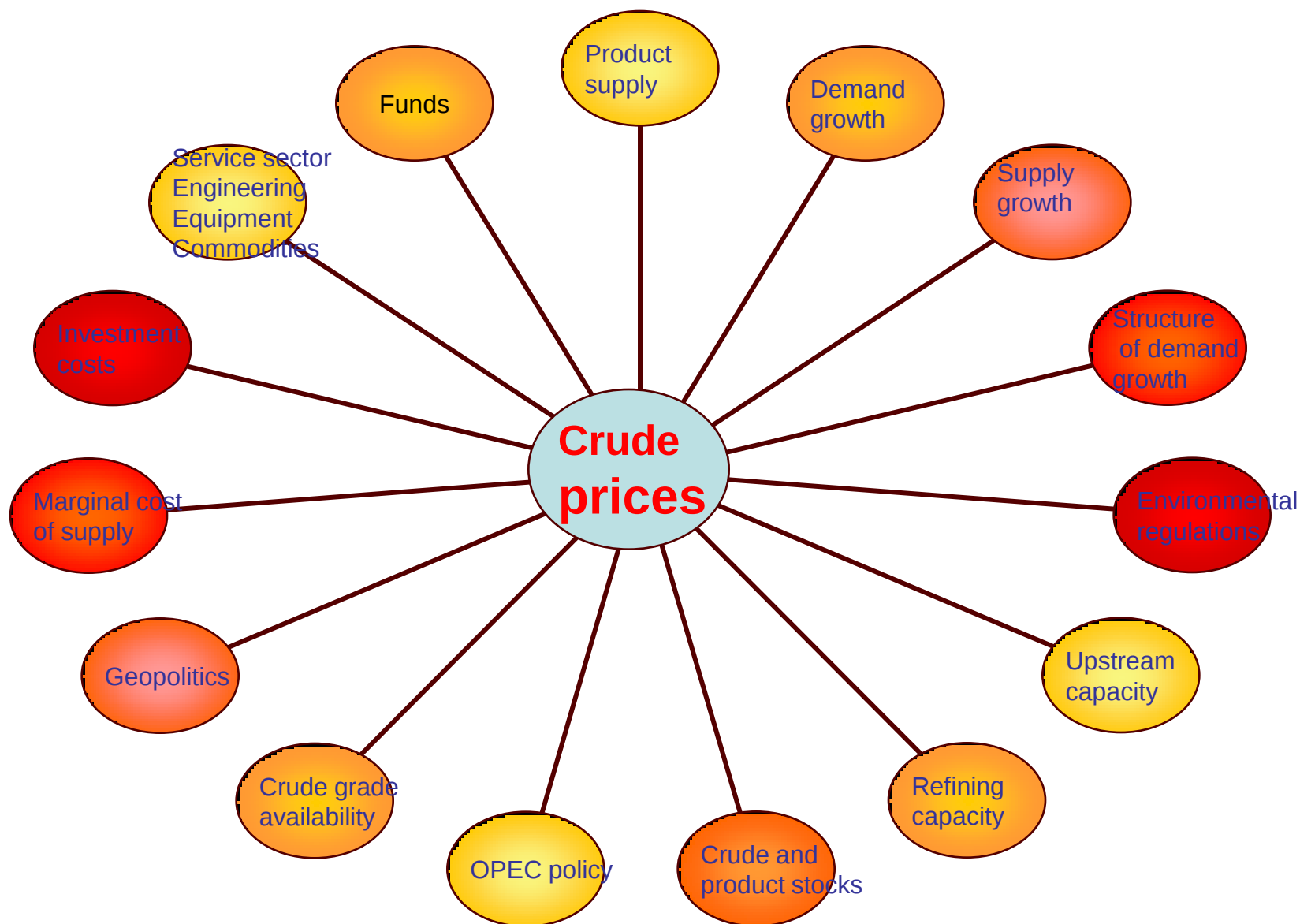
Oil prices at record nominal highs

close to record on inflation adjusted basis



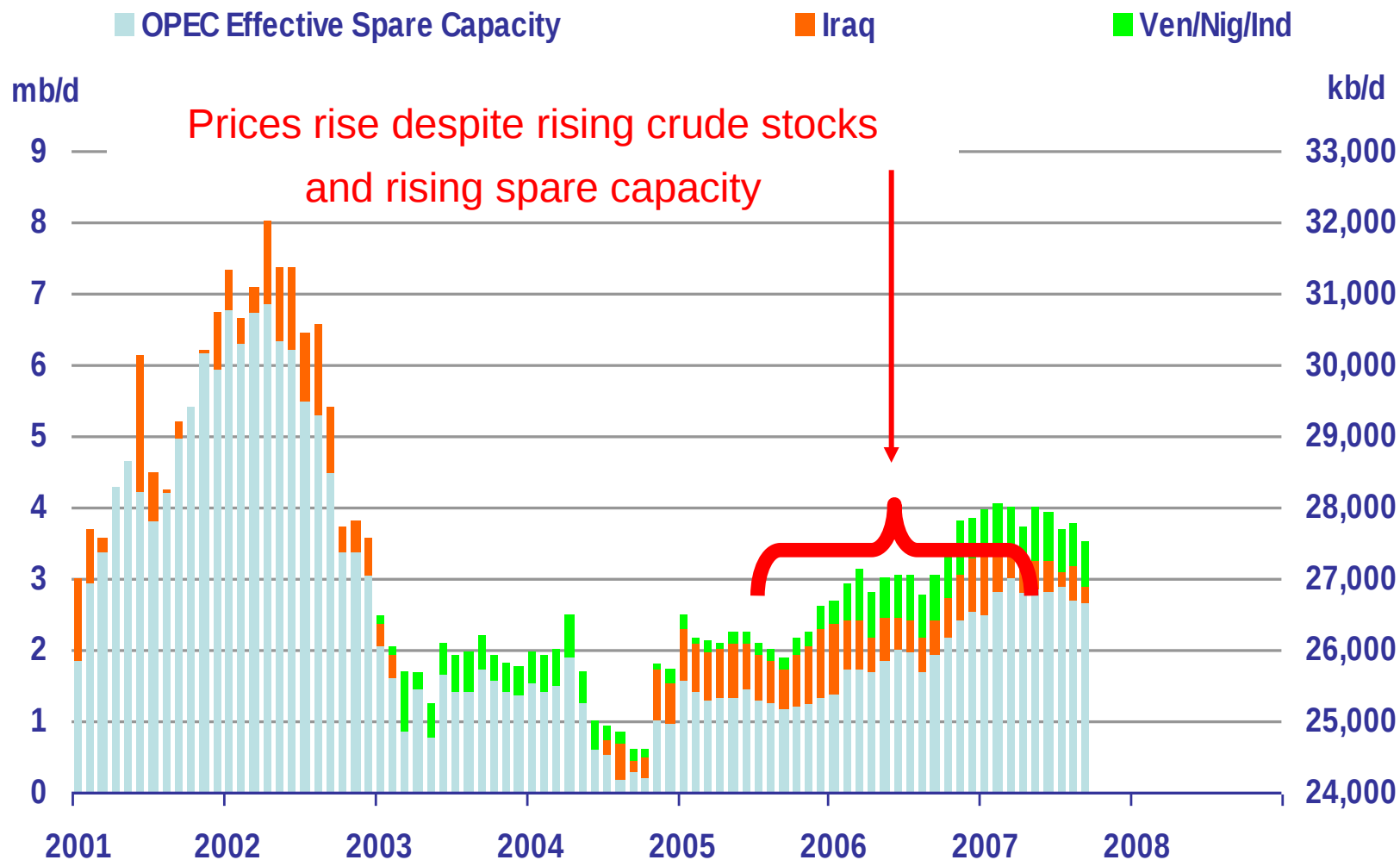
But why?

No single cause of high prices



Recovering spare capacity from 2005

but prices continue to rise



Effective spare capacity (excl. Iraq/Venezuela/Nigeria/Indonesia) around 2.85 mb/d in May

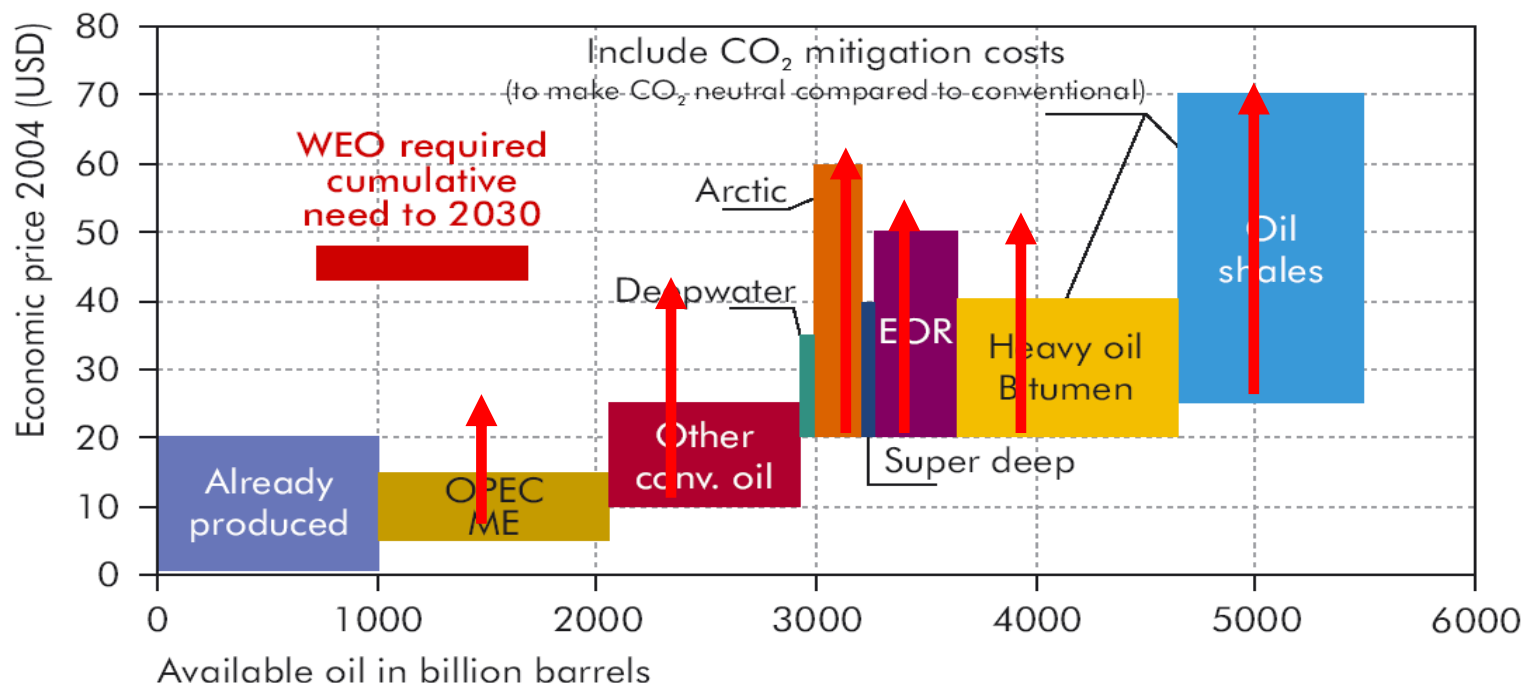
Refining capacity constraints added to by environmental and blending restrictions

- Low-sulphur fuel requirements could cause refineries to shut down completely when units go off-line
- High ethanol RVP means gasoline blending requires lower volatility blending components
 - Lower volumes in summer
- Multitude of fuel specs constrain trade

No surprise that easing of gasoline specs in the US following Hurricane Katrina resulted in a significant increase in domestic and imported gasoline supply

Cost inflation dampens investment impact

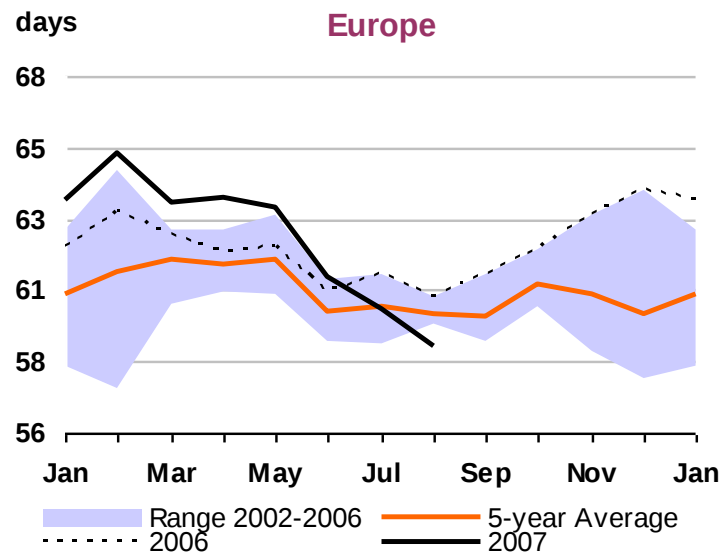
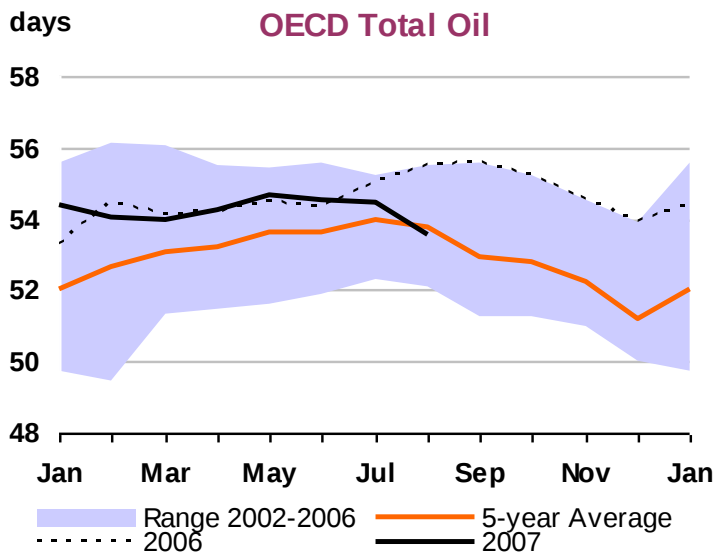
(long-term futures prices remain above \$60)



Source: *Resources to Reserve*, IEA, 2005

- Tight service sector causes further cost inflation - \$35 to \$55/barrel?
- Call option for speculators/OPEC?
- Marginal cost of non-OPEC production influential when OPEC producing flat out
- When spare capacity exists, price OPEC are willing to keep spare capacity off the market is the key

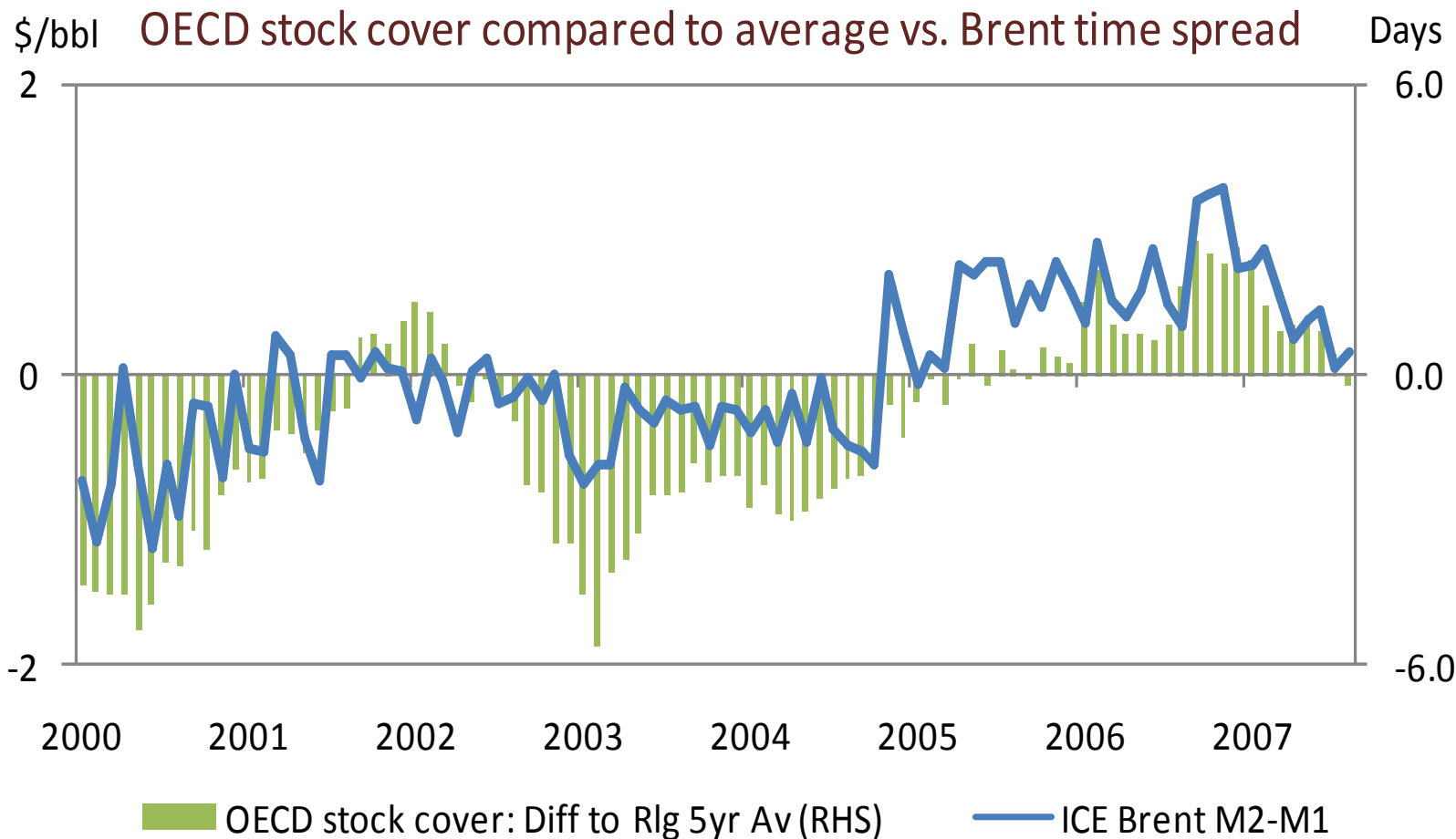
Forward demand cover falls below average



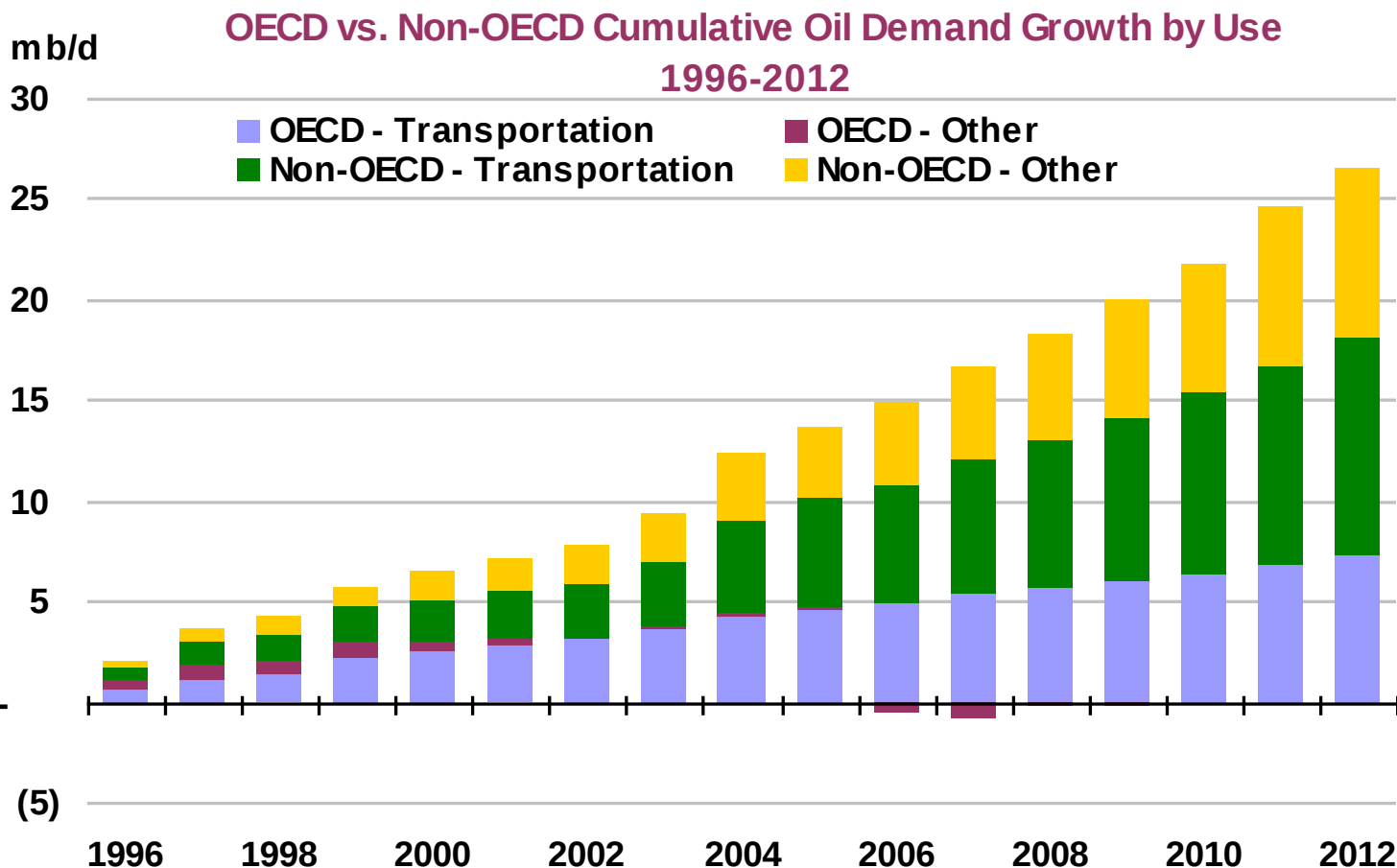
Source: IEA Oil Market Report

- OECD forward demand cover fell to 53.5 days in September, now below five-year average.
- European cover is particularly low, relative to historical levels.

Stock cover shows switch to tighter conditions

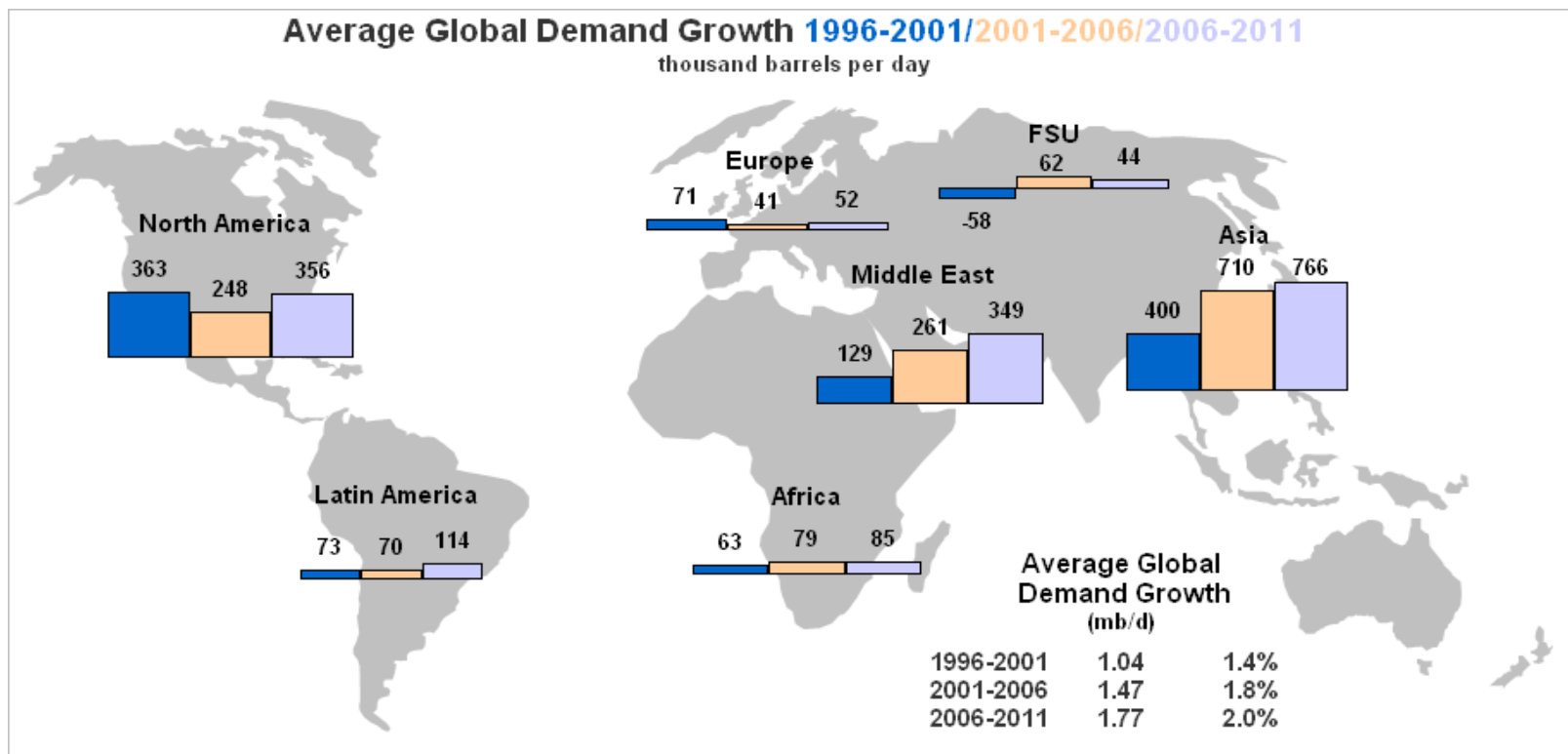


Medium-term demand growth still seen robust ...



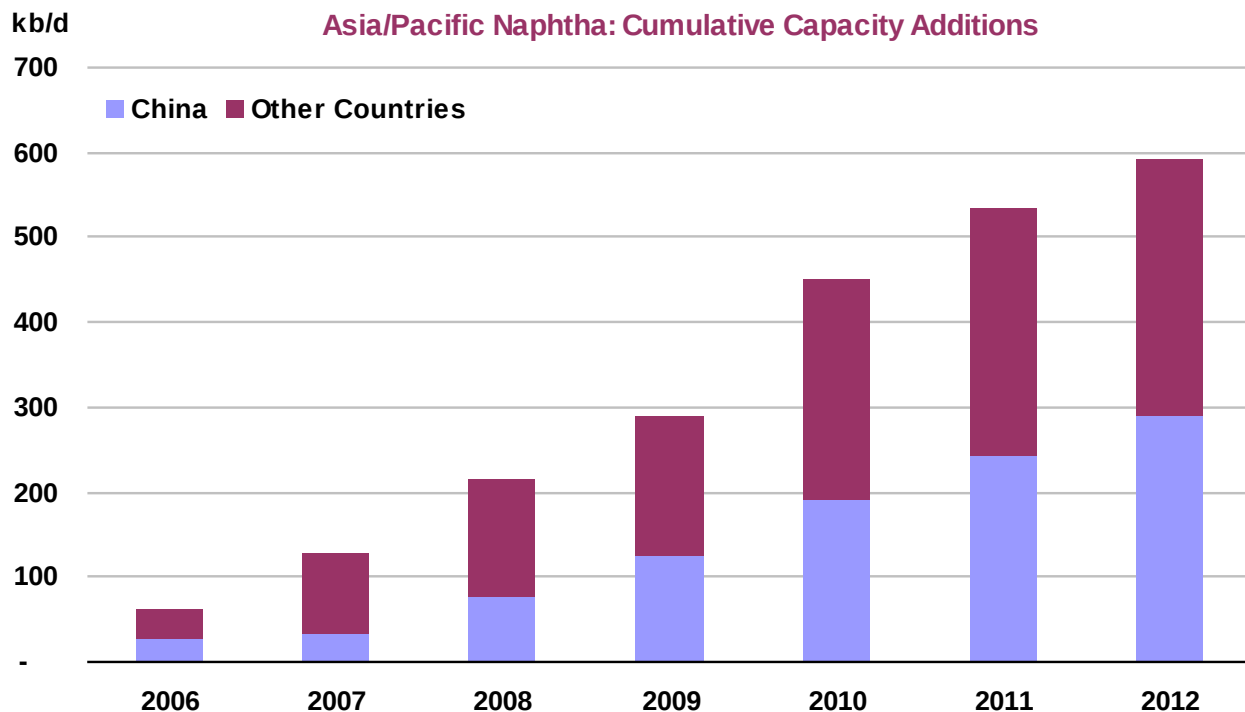
- By 2012 demand set to grow +9.7 mb/d to 95.8 mb/d
- Though downside risk to robust GDP growth assumptions

Global demand growth, but significant regional variations



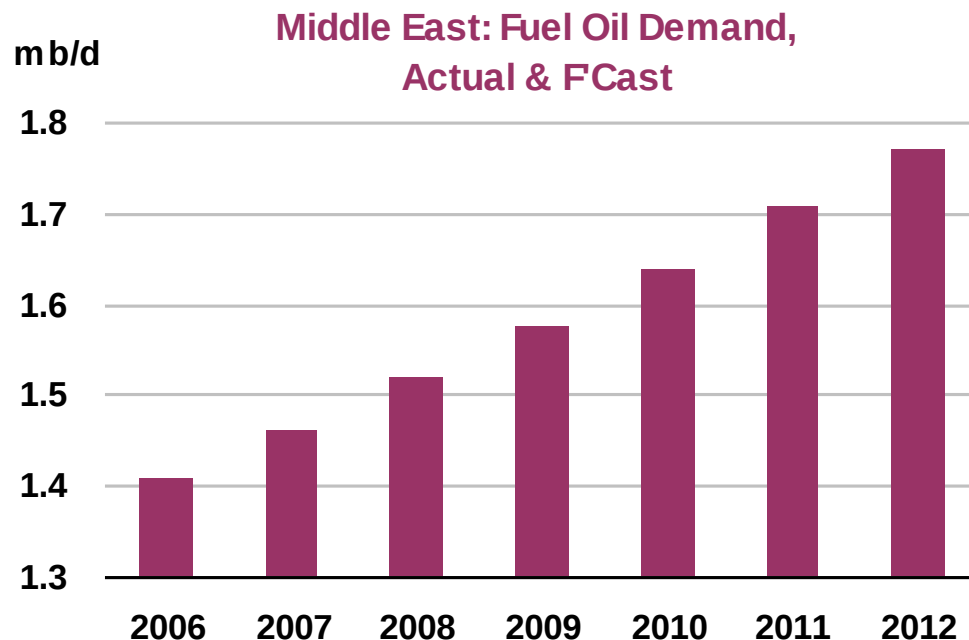
- OECD: demand sustained by **North America** – 51% of regional and 30% of global demand
- Non-OECD: **Asia** demand accounts for 45%, and the **Middle East** for 18%

Focus: China's petchem expansion



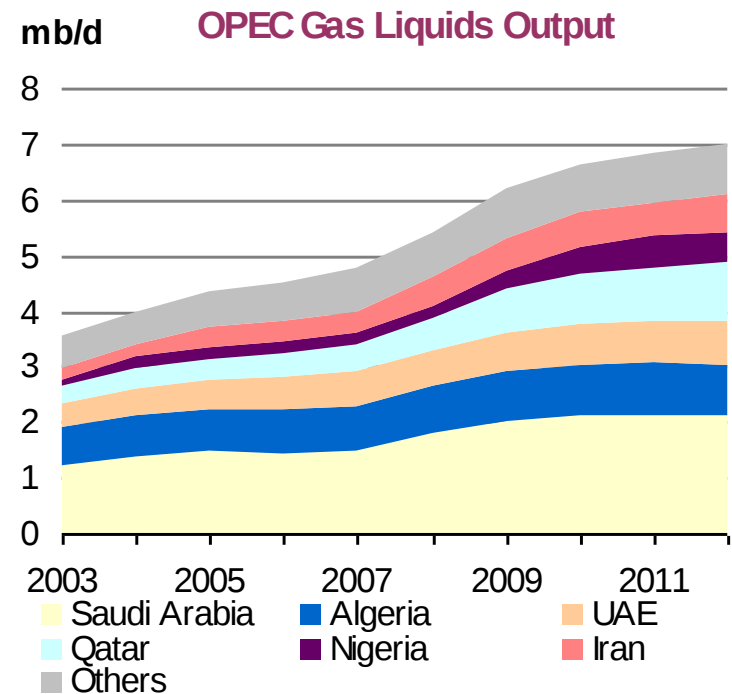
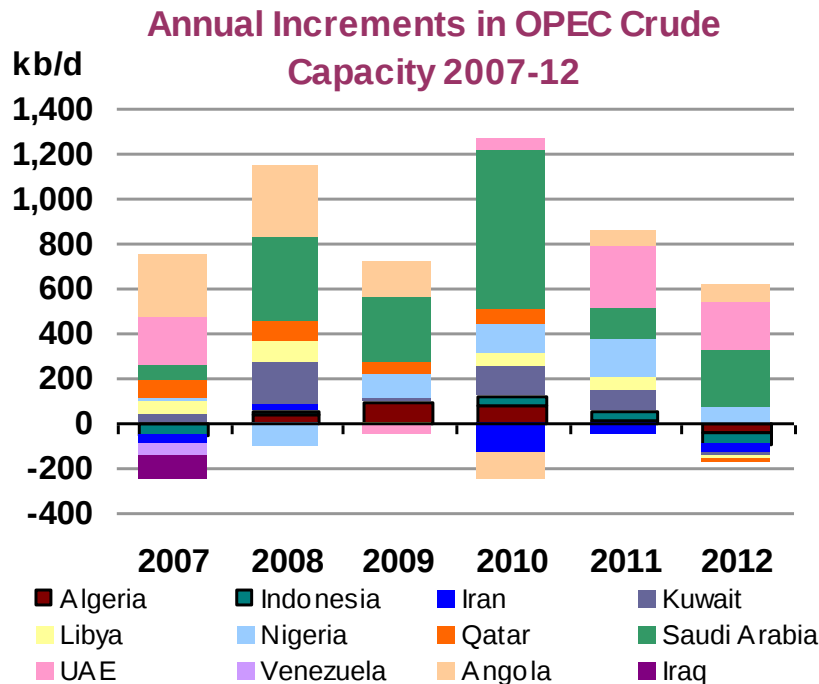
- China has ambitious plans to **expand its petrochemical base** and become a major global producer
- **Naphtha** demand is **growing apace**:
 - +6.9% on average between 2007 and 2012, expected to reach 1.27 mb/d
 - Already equivalent to 12% of total Chinese oil product demand; 13% by 2012

Focus: ME fuel oil thirst



- Facing **power shortages** and **lacking enough natural gas** to meet generation needs, the region is turning to fuel oil
- **Economic advantages:**
 - Less urgent to upgrade refineries or process light crudes
 - Heavy crudes can be easily converted into fuel oil
 - Excess crude for direct burning can be exported
- However, risk of **FO tightness in the medium-term** and **environmental consequences**

Significant medium-term growth in OPEC crude capacity and NGLs

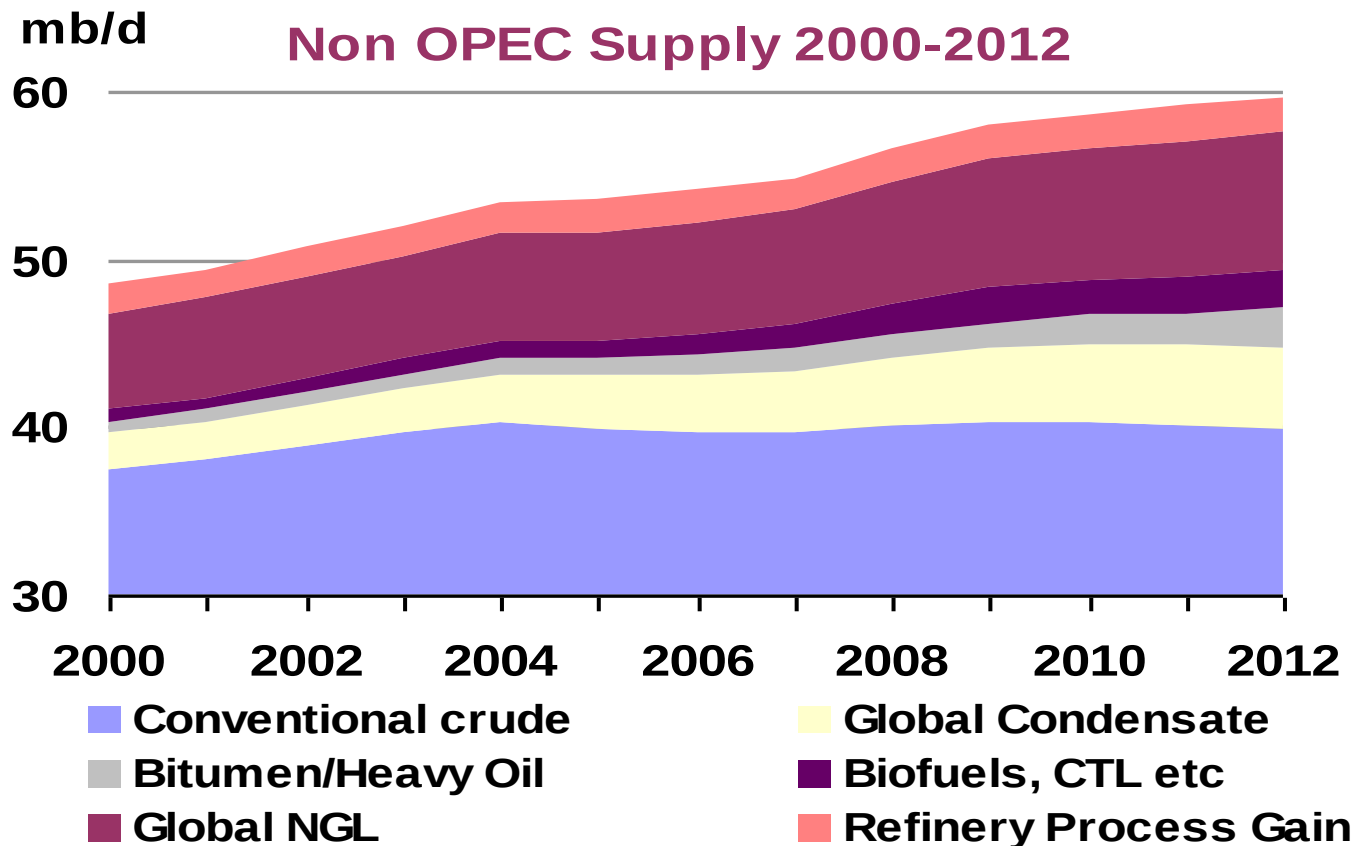


- Angola, Saudi, UAE & Nigeria are key crude capacity contributors
- Assumes flat/declining capacity from Indonesia, Iran, Iraq & Venezuela
- Net +4 mb/d, reaching 38.4mb/d in 2012

- 8% pa growth in off-quota condensate & NGL
 - Saudi Arabia, Qatar & Iran are key
- Based on domestic gas utilisation & LNG
 - These too are delay-prone
- But forecast just matches early-decade growth and implies steady gas-liquids ratio

Non-OPEC supplies also rise

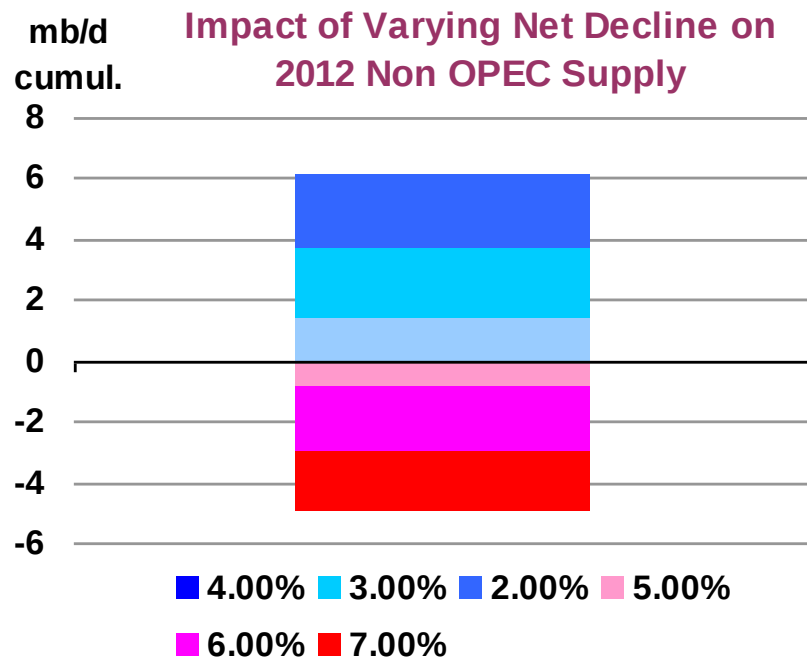
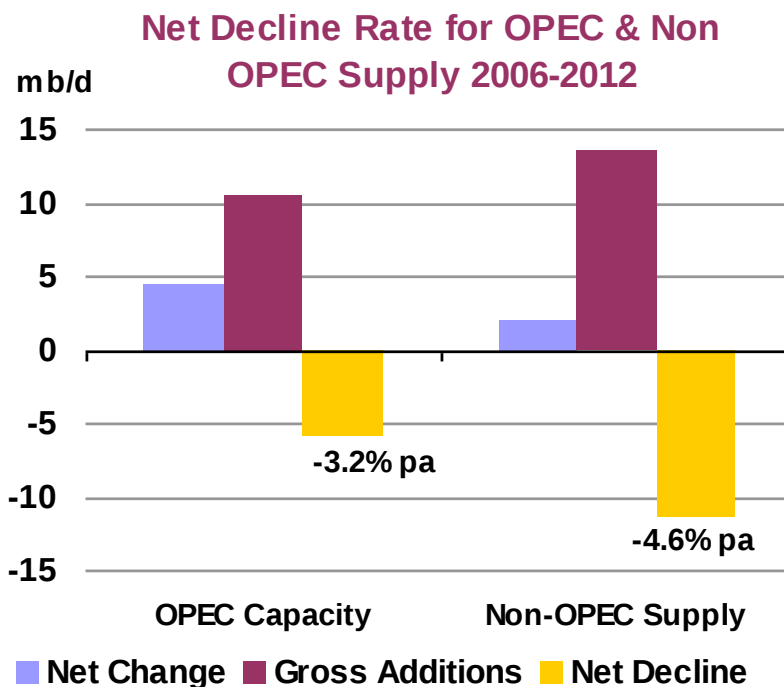
main growth in non-conventional



- **Total non-OPEC liquids rise 2.6 mb/d by 2012, but restrained by higher costs & lack of access**
- **However, higher prices have boosted exploration**

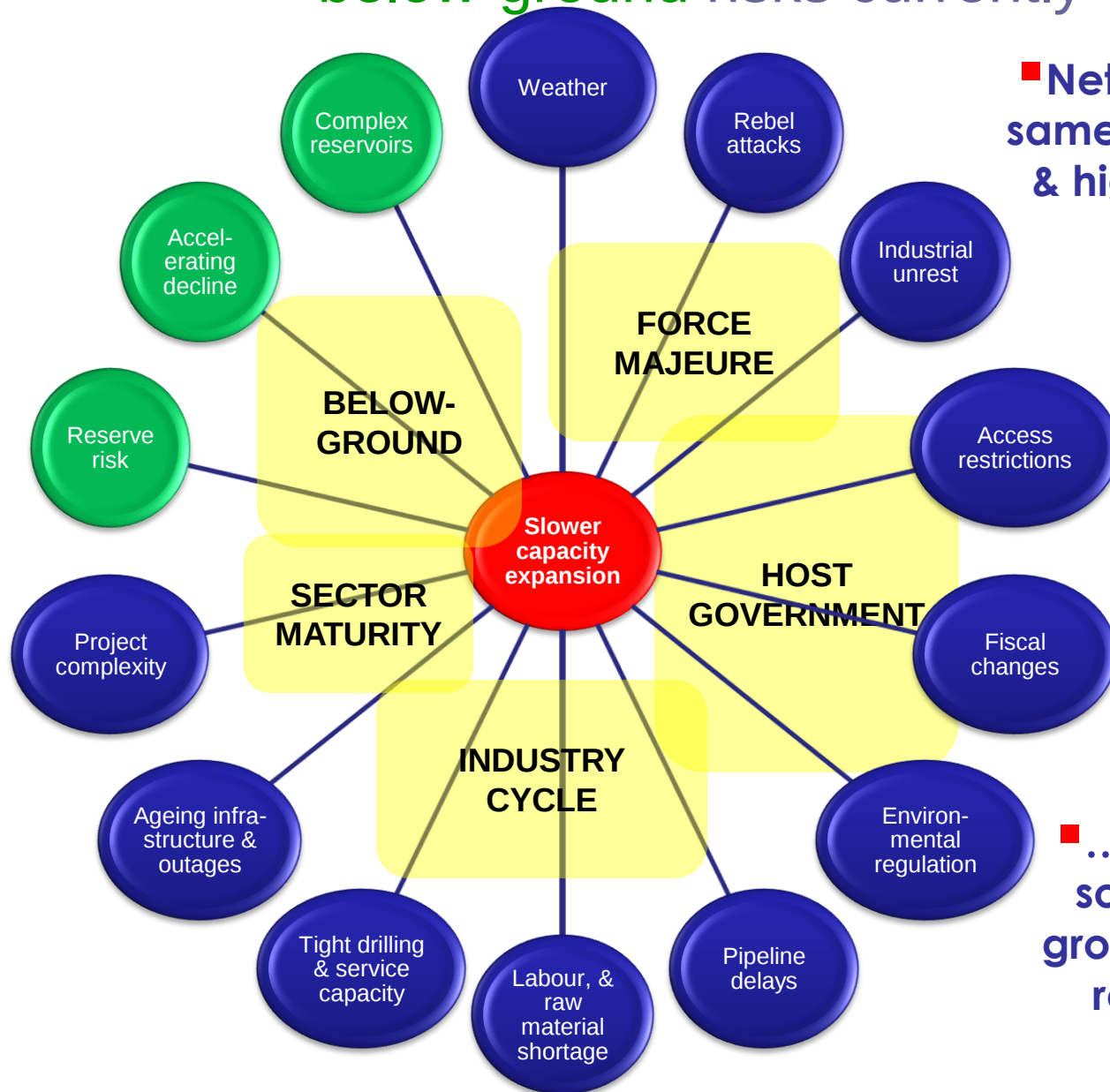
Non-OPEC net decline averages 4.6% pa

a hugely important supply variable



- Globally, 3 mb/d needs to be added to capacity just to keep production steady
- Sensitivity on non-OPEC side is the difference between an OPEC call of 31, 37 or 42 mb/d in 2012

Above-ground risks exceed below-ground risks currently

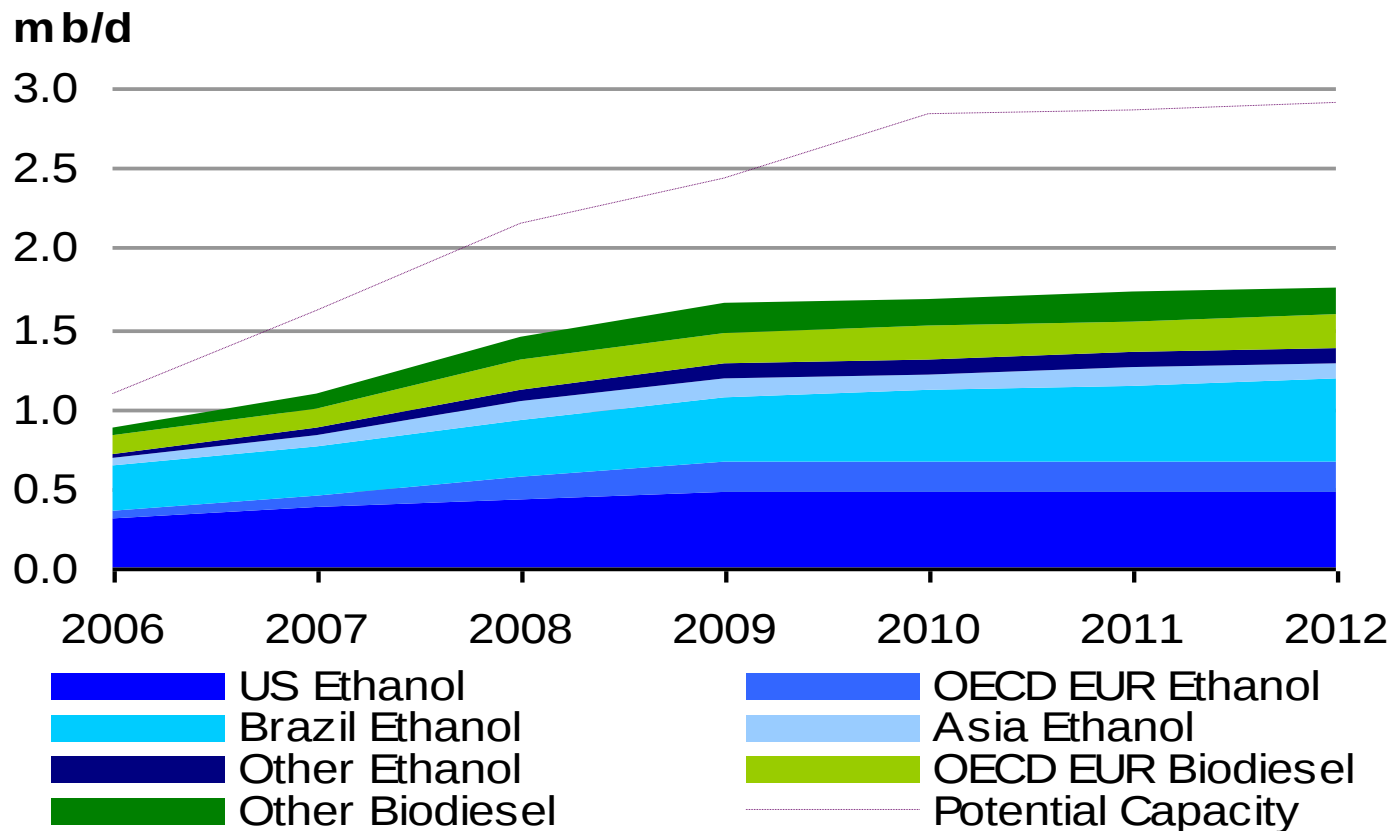


■ Net impact is the same (lower output & higher costs)...

■ ...but at least some above ground risks are reversible?

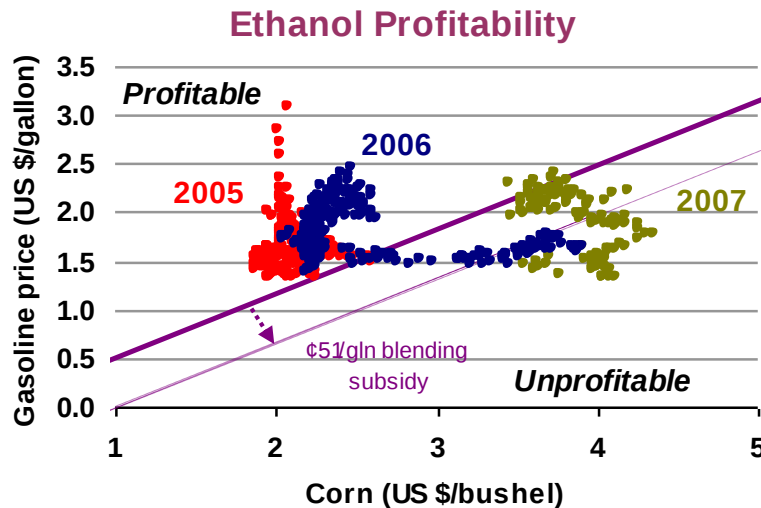
Biofuels marginal but significant addition

Biofuel Production & Capacity

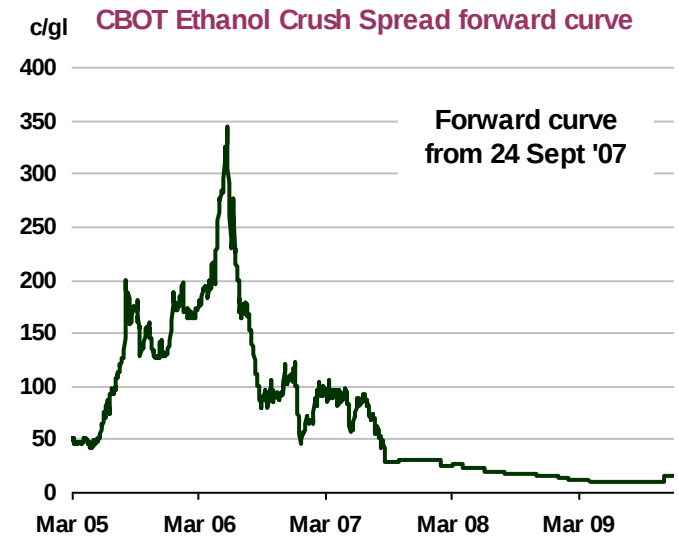


- Global biofuel production **doubles to 1.75 mb/d** by 2012
- Potential supply capacity even higher: 2.9 mb/d by 2012

Concerns over economic viability



The profitability line (net of subsidies) has been estimated to take into account the value of ethanol on an energy basis, a price premium for octane and oxygen and a price premium for the sale of co-products.

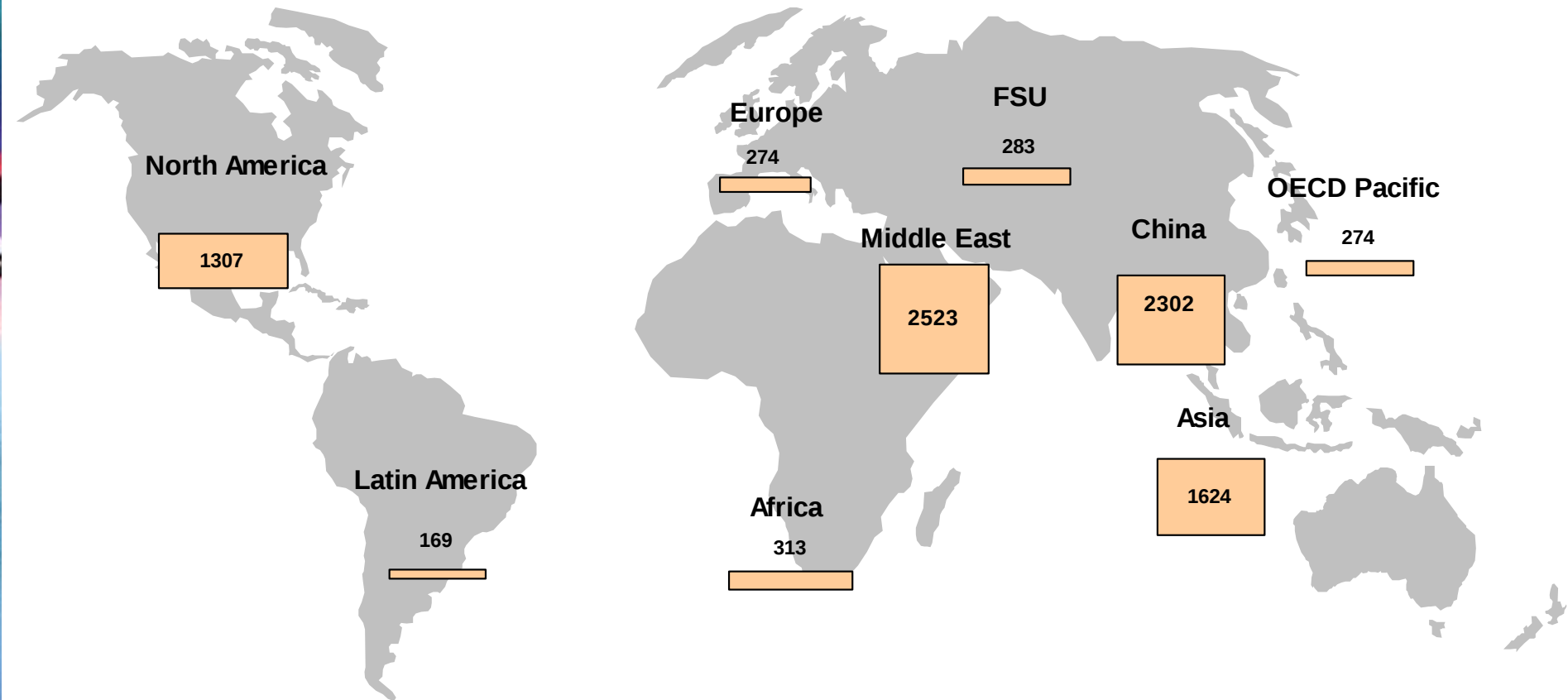


- **We maintain our cautious stance on medium-term production potential**
 - **Price pressures on feedstocks (corn, sugar, soybeans, wheat, palm oil etc)**
 - **Competition between first-generation biofuels and the food chain**
 - **Second generation technologies look promising but depend on technological breakthroughs**



Global refining industry -substantial growth

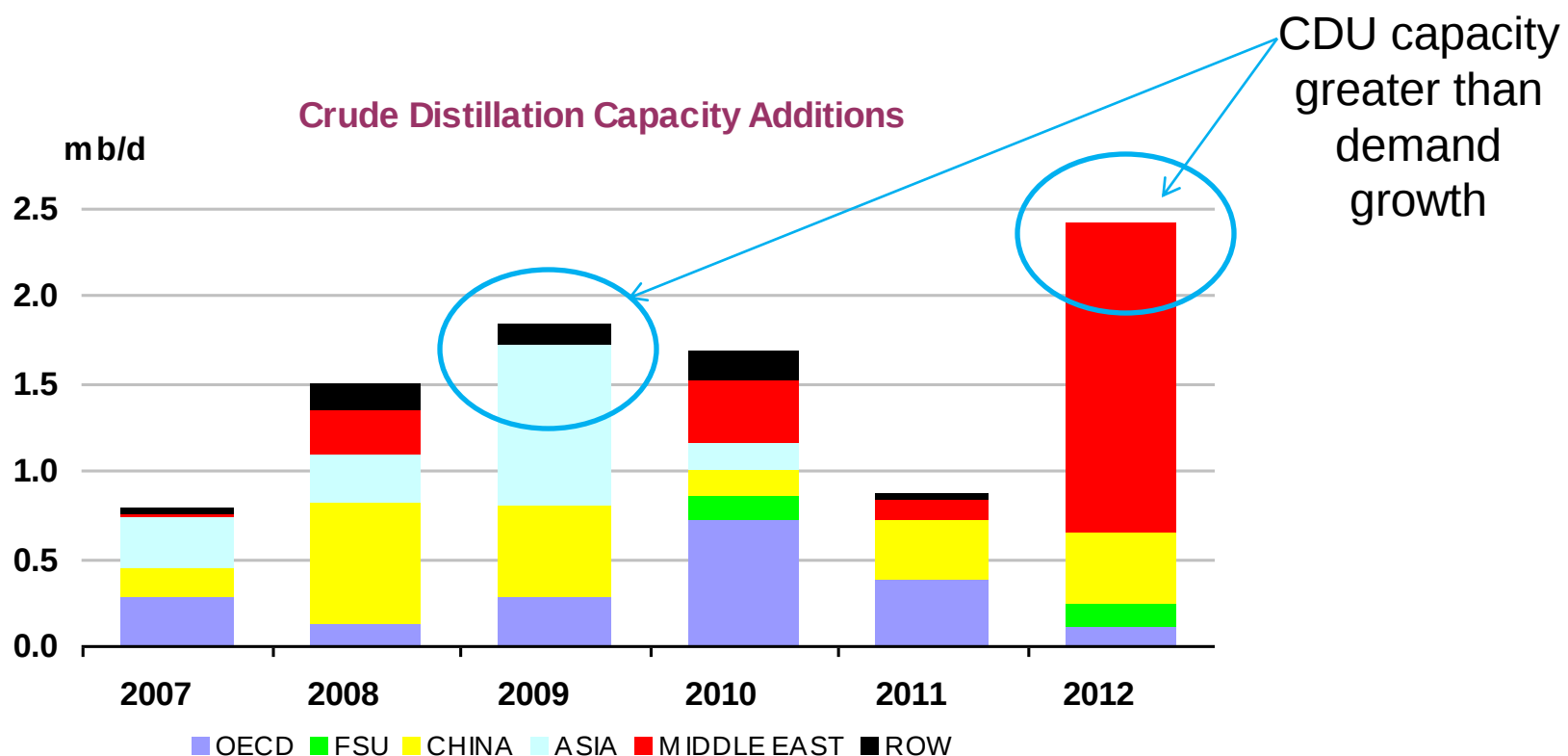
Crude distillation capacity investment
thousand barrels per day



- Middle East, China & Other Asia are 2/3rds of the total increase
 - OECD 1.8 mb/d, of which North America 1.3 mb./d
- 274kb/d linked to new upgrading units in Spain, Greece & Hungary

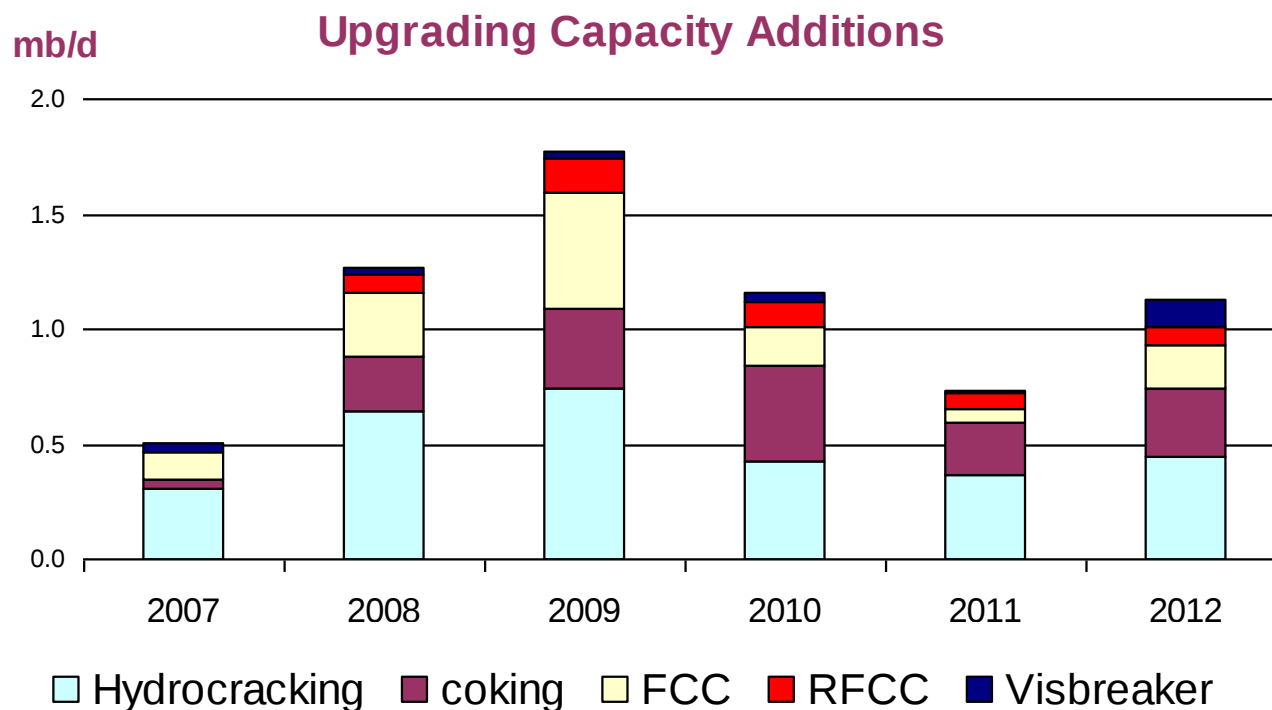


Strategic investment drives growth



- Growth is largely reliant on a few key countries
- Cost pressures continue to affect investment economics and timing
- Large proportion of projects vulnerable to margin cycle and future returns

Upgrading investment adds flexibility



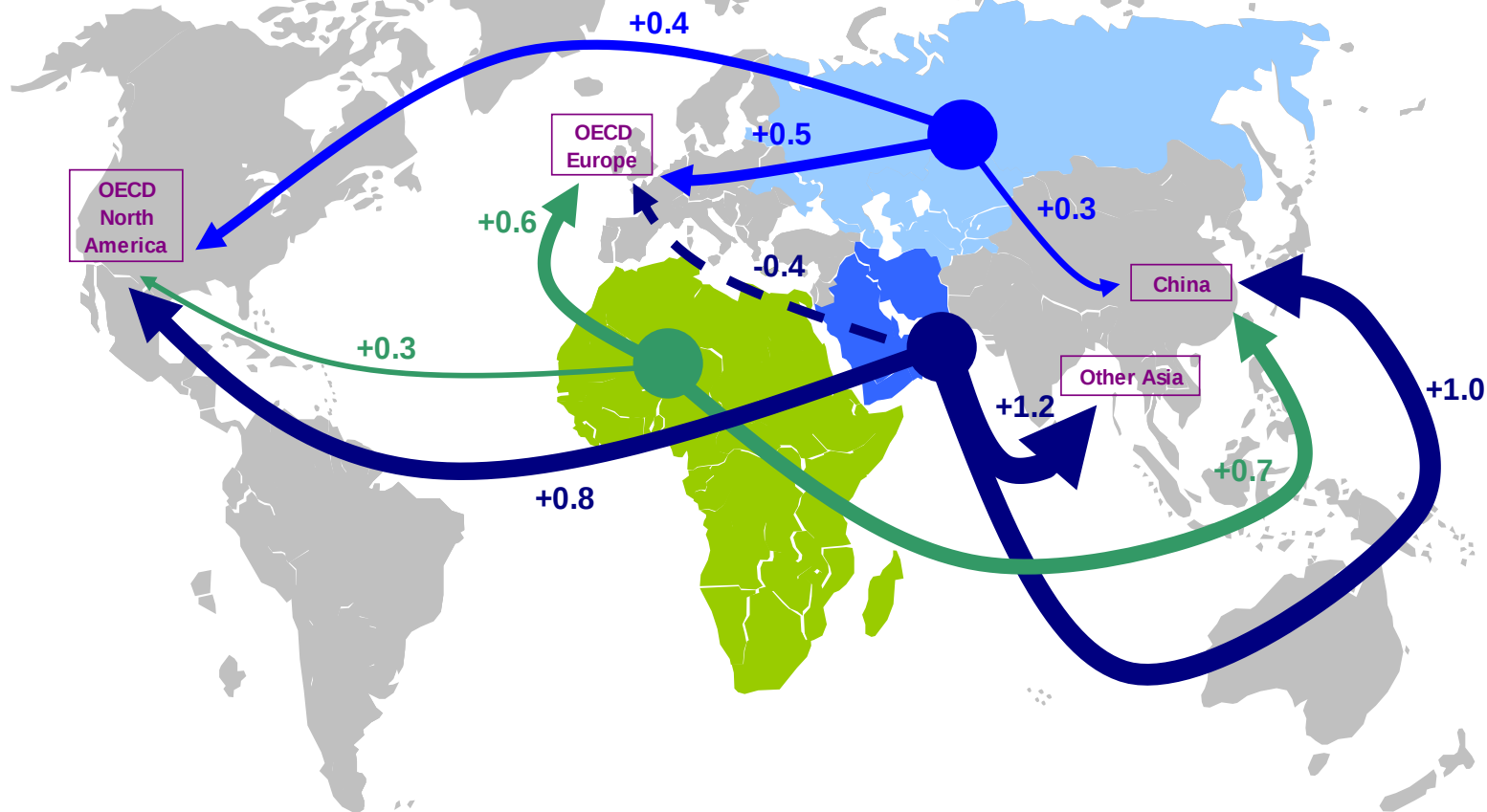
- Global refining system will benefit from addition of further upgrading capacity
- This will boost heavy sour crude processing ability
- Expansion focused on the addition of hydrocracking and coking capacity

Growth in global crude trade

Net Export Growth 2007-12 for Key Trade Routes*

(million barrels per day)

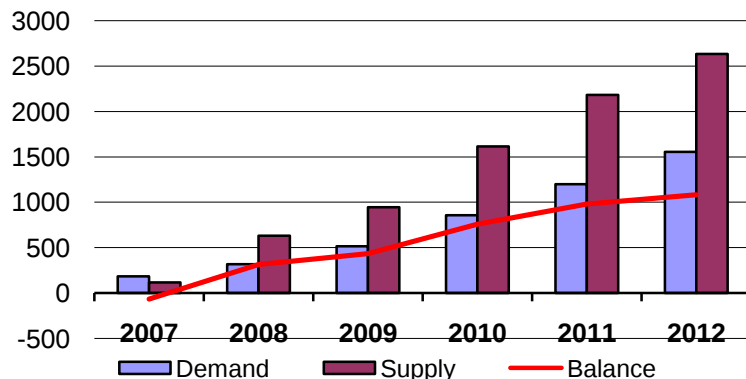
* Excludes Intra-Regional Trade



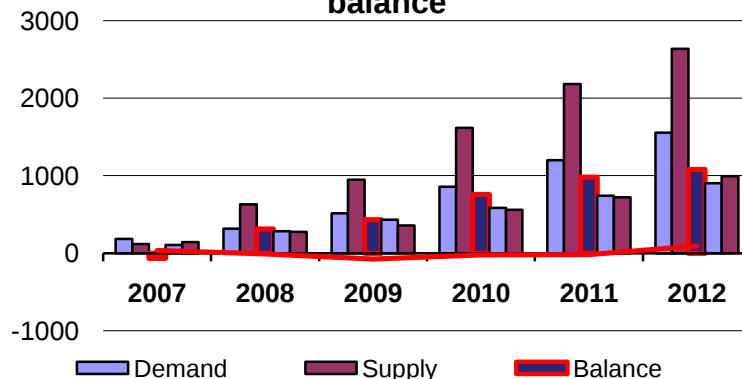
Global product balances

more gasoline, less fuel oil

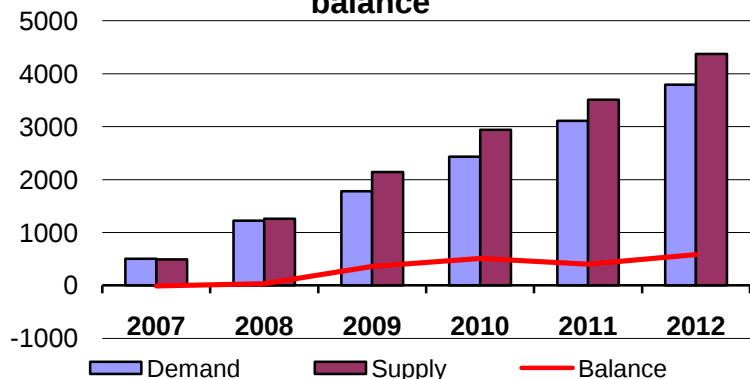
Gasoline cumulative product balance



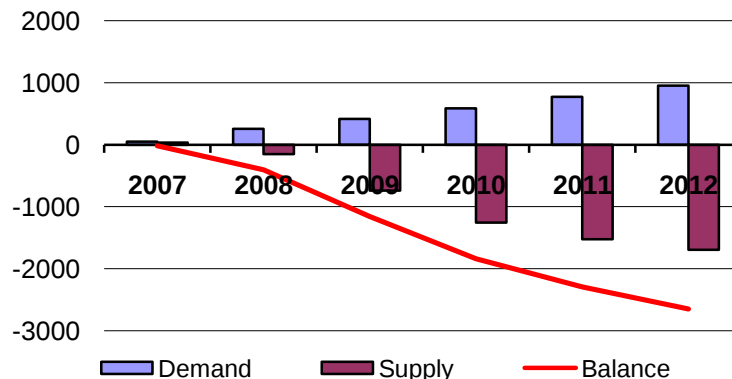
Jet and Kerosene cumulative product balance



Gasoil and diesel cumulative product balance



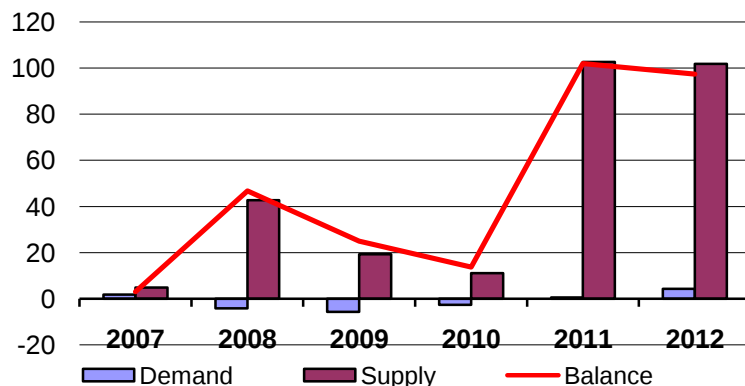
kb/d Fuel oil cumulative product balance



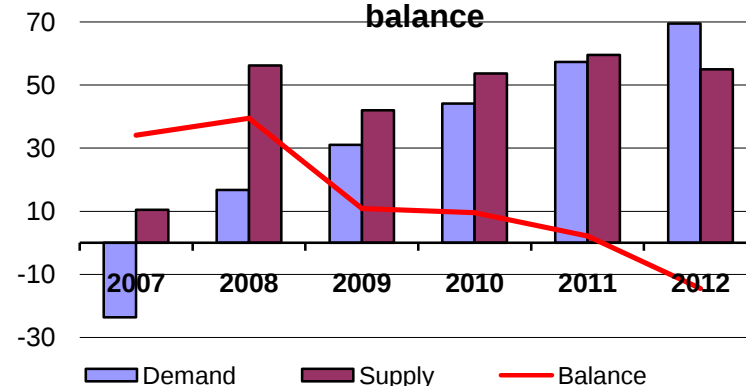
Asia Pacific product balances

more gasoline, less fuel oil

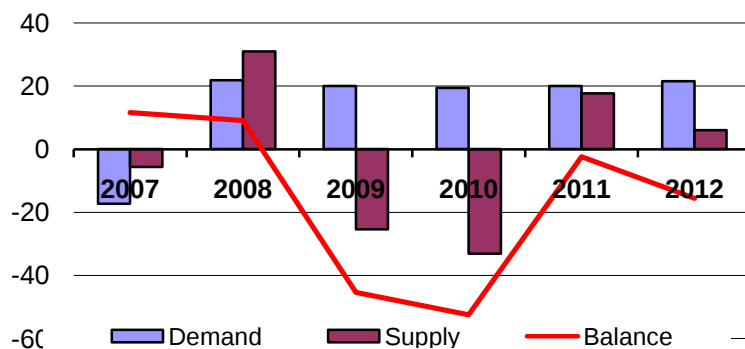
Gasoline cumulative product balance



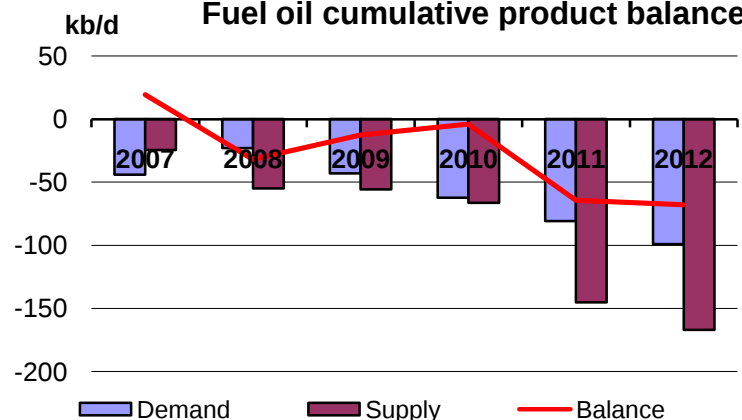
Jet and Kerosene cumulative product balance



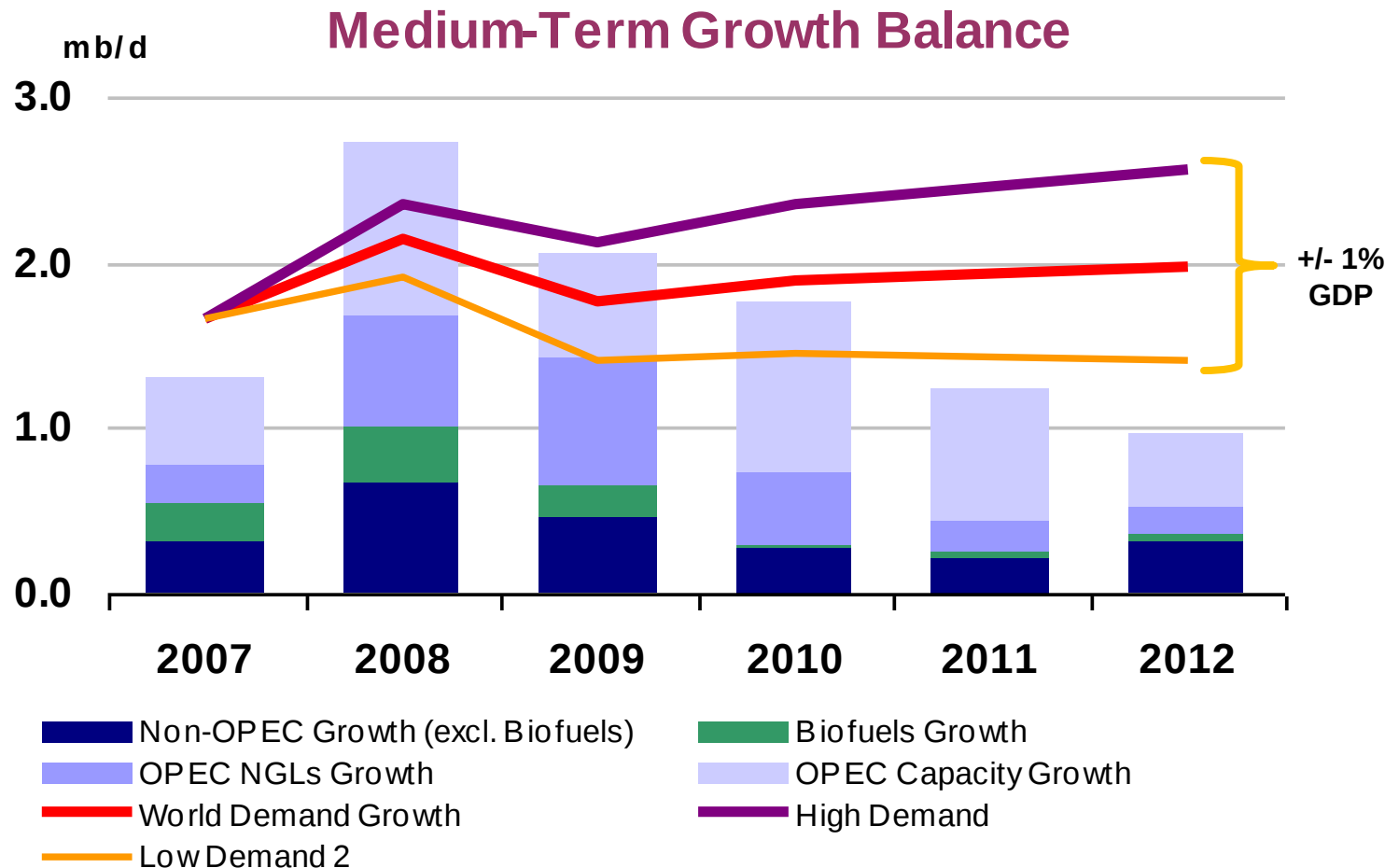
Gasoil and diesel cumulative product balance



Fuel oil cumulative product balance

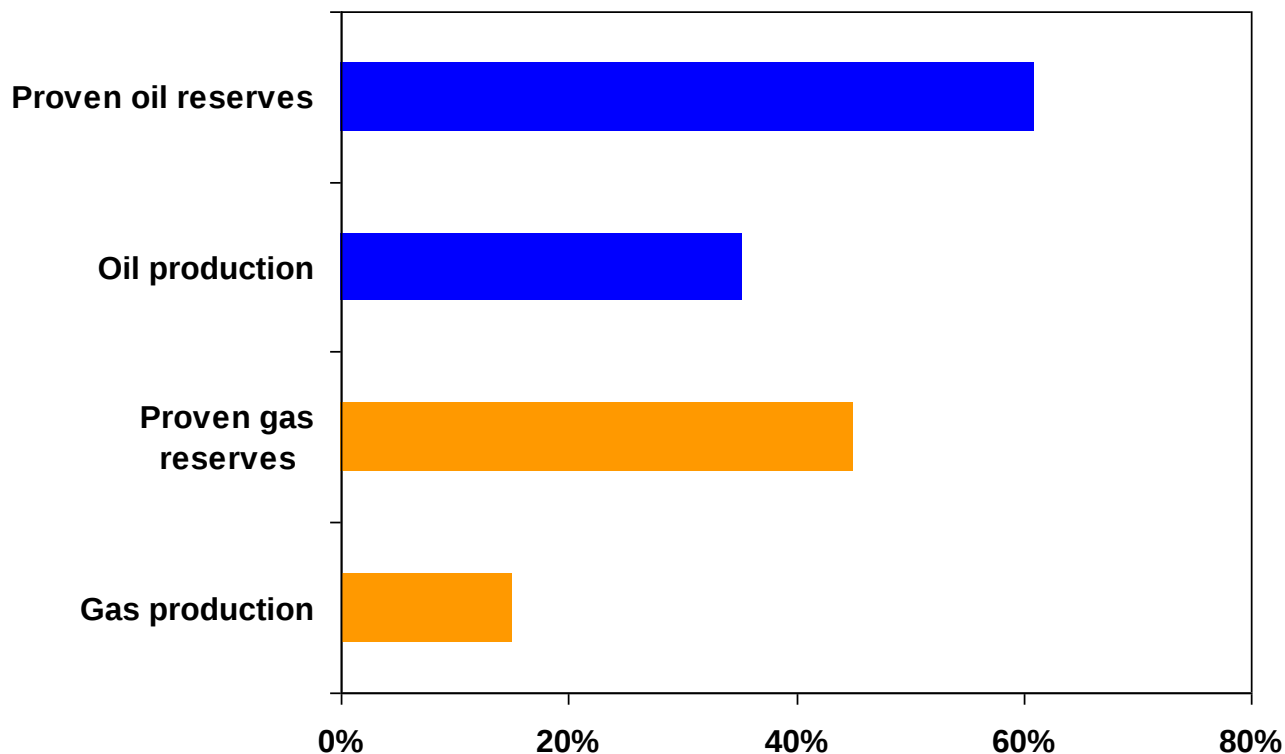


Balance tightens towards 2012



- Adjusted call on OPEC/stock chg: **+5 mb/d by 2012**
- OPEC spare capacity to fall from 2.5 -> 1.5 mb/d

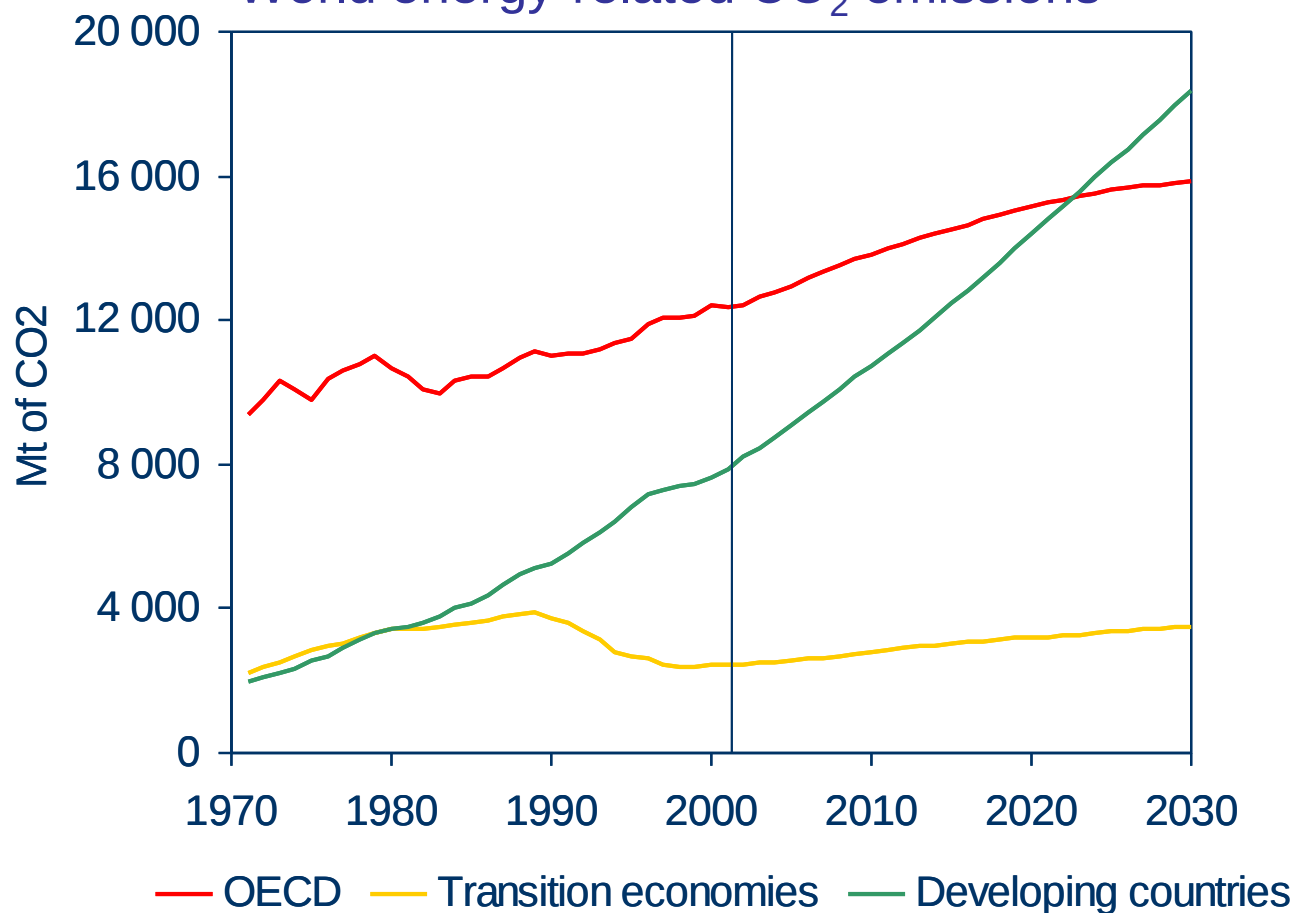
MENA share in world oil and gas reserves & production, 2004



MENA share of global oil & gas reserves is much higher than its share of current production, suggesting strong potential for growth

Current path is not sustainable

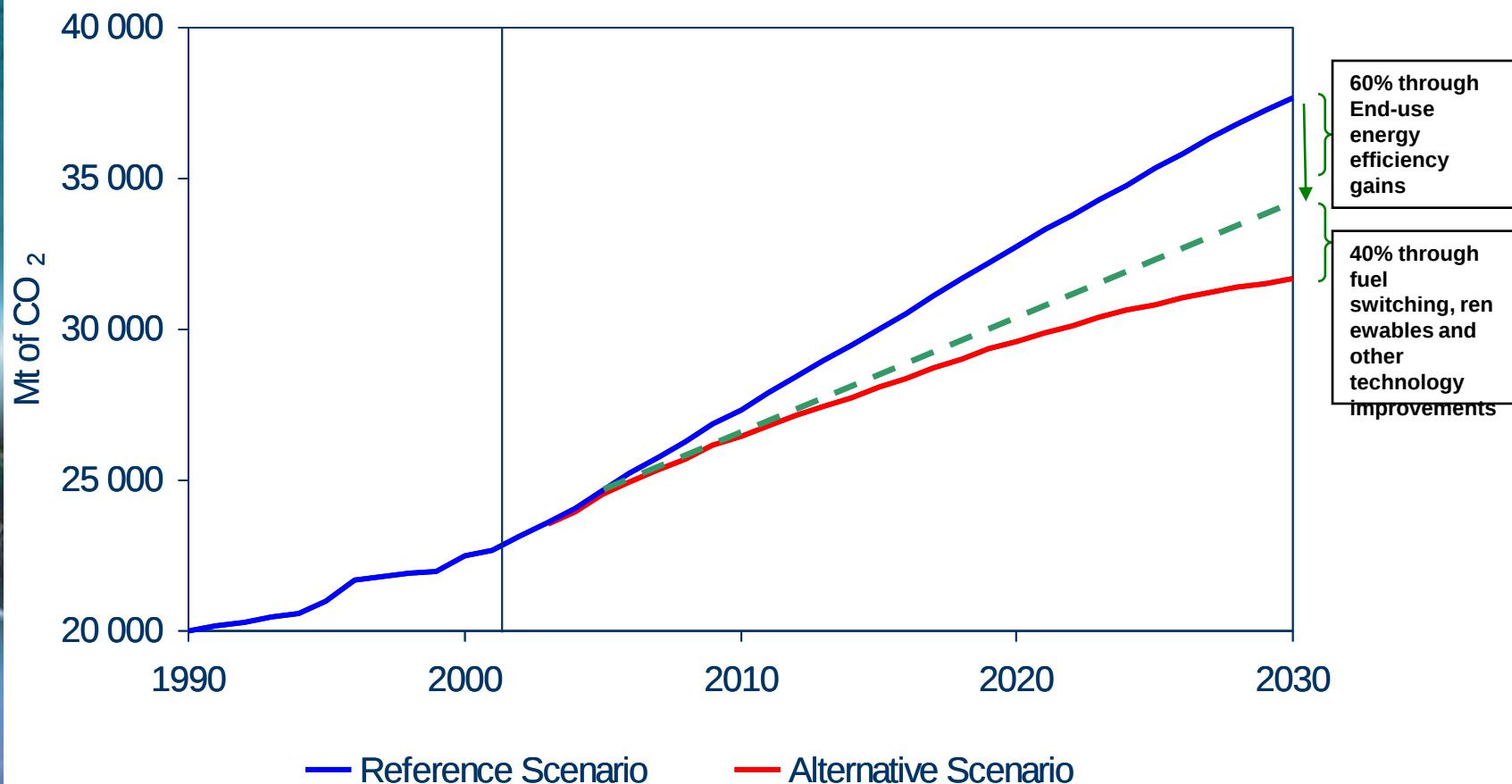
World energy-related CO₂ emissions



Global emissions grow 62% between now & 2030, with developing countries' emissions overtaking OECD's in the 2020s

The future is not pre-determined

Global CO₂ Emissions in the Reference & Alternative Scenarios



Policies that governments are already considering – but have not yet enacted – would cut CO₂ emissions by 16% in 2030

Energy Efficiency has a Key Role To Play and is Available In the Short Term



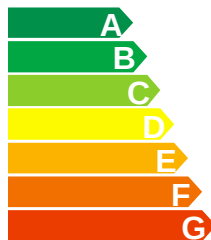
High-performance buildings



Least life-cycle cost
appliances



Labelling and certification



Efficient information and communication
technologies



Reducing standby power
consumption



Super windows
and daylighting

Energy efficiency offers

- substantial energy and greenhouse gas savings at low or negative cost
- energy security and reliability benefits
- enhanced business competitiveness and social welfare



Compact Fluorescent Lamps

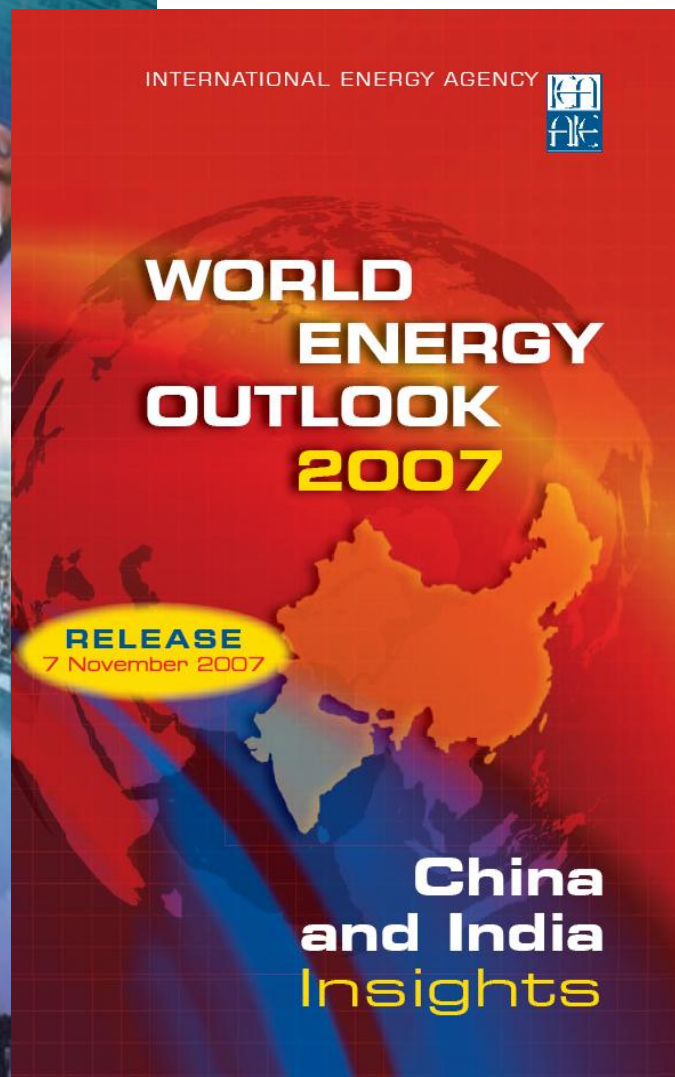


LED traffic lights

Conclusions

- Oil prices are near record highs in real terms
 - Upstream and downstream supply constraints
 - Refining tightness could ease, but subject to cost considerations
 - Modest build in OPEC spare capacity, but it is unlikely to last
 - Demand seen robust, but downside risks prevail
- Long-term path is not sustainable
 - A more sustainable energy future is possible with known technology. The costs are not out of reach
 - But urgent action is needed:
 - Overcome barriers for adoption of energy efficient technologies
 - Enhance R&D
 - Accelerate demonstration and deployment
 - Provide clear and predictable incentives
- Collaboration between developed and developing countries essential

World Energy Outlook 2007



- Detailed analysis of the energy and environmental prospects for China and India
- Assessment of the implications for global energy markets, climate, world economy and government policy
 - Scenario approach:
 - Reference Scenario
 - Alternative Policy Scenario
 - High Growth Scenario
- Development of detailed data-bases and models for China and India, including China coastal regions.
 - Cooperation with China's NDRC, India's TERI, IMF, World Bank, Asian Development Bank, CIRED, etc.