

World Energy Outlook 2008

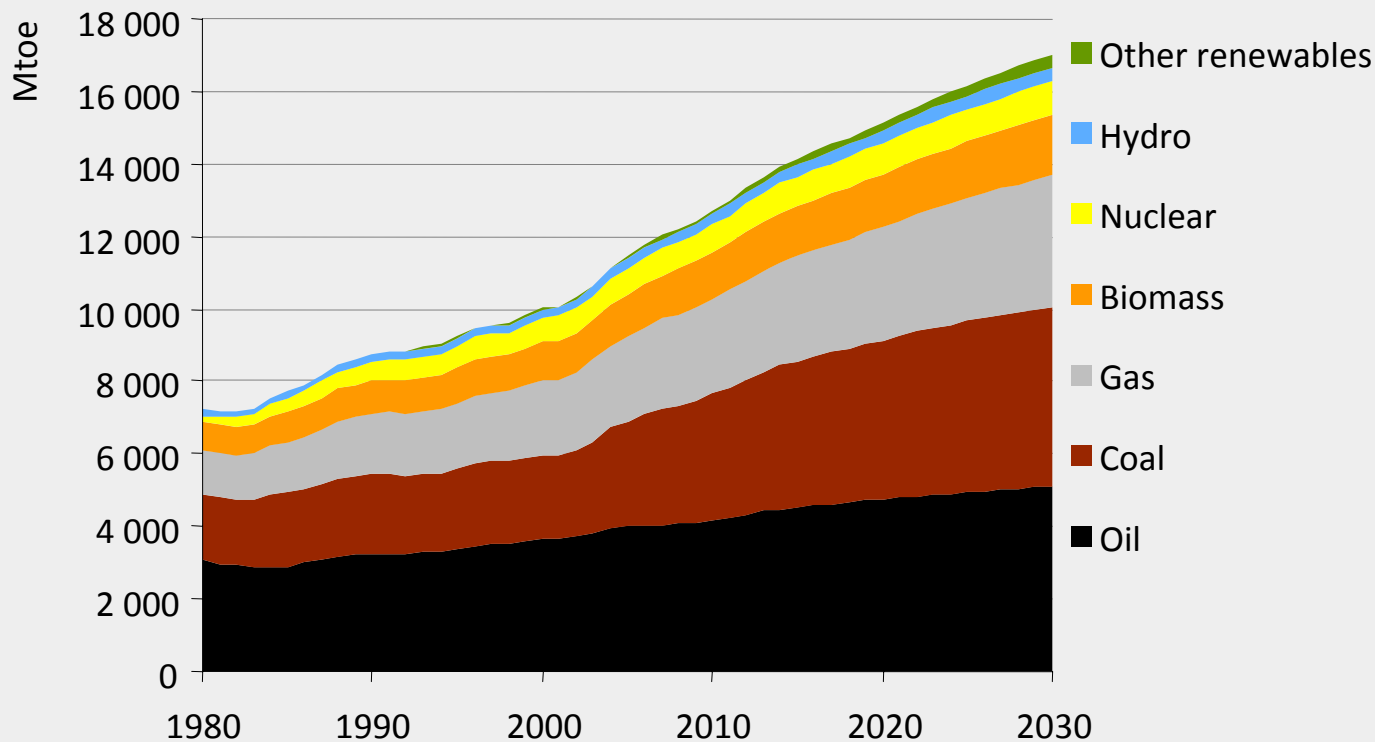
**UNECE Committee on Sustainable Energy
*Strategic Alliances for Energy Security***

Geneva 20 November

Ralph.Sims@iea.org

World primary energy demand in the Reference Scenario: unsustainable!

World
Energy
Outlook
2008

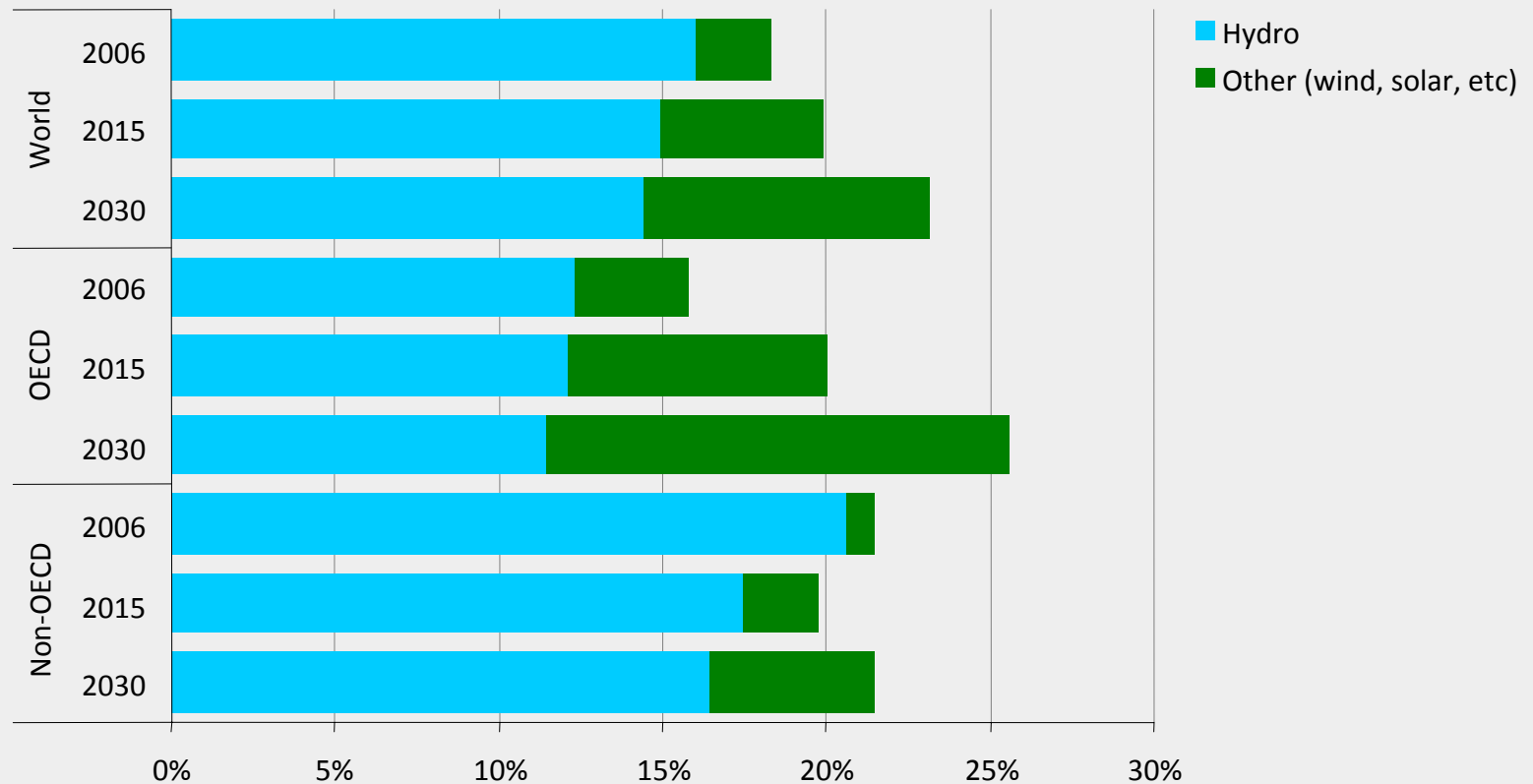


World energy demand expands by 45% between now and 2030 – an average rate of increase of 1.6% per year – with coal accounting for more than a third of the overall rise

Current policies will lead to a fossil fuel future

Share of renewables in electricity generation in the Reference Scenario

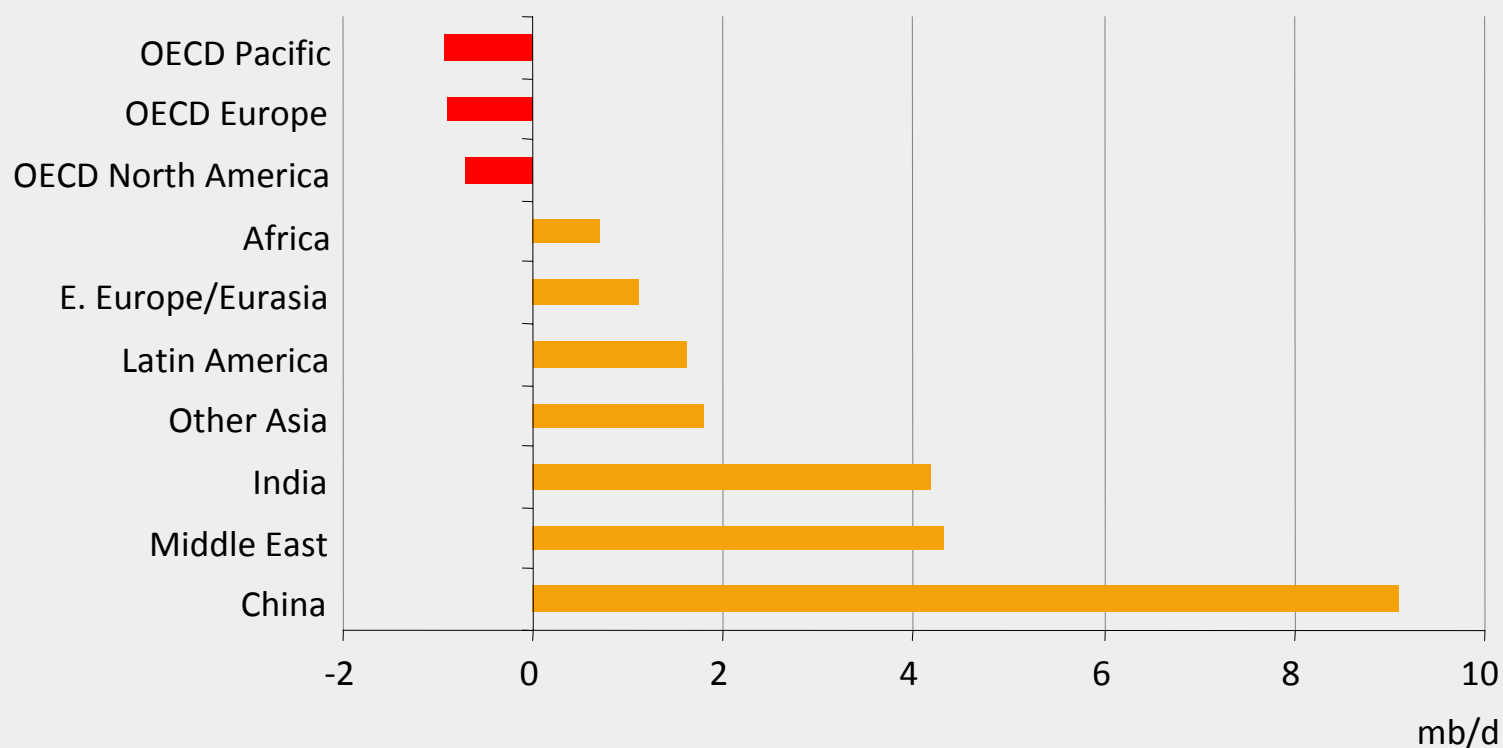
World
Energy
Outlook
2008



Soon after 2010, renewables become the 2nd-largest source of electricity behind coal, thanks to government support, prospects for higher fossil-fuel prices & declining investment costs

Change in oil demand by region in the Reference Scenario, 2007-2030

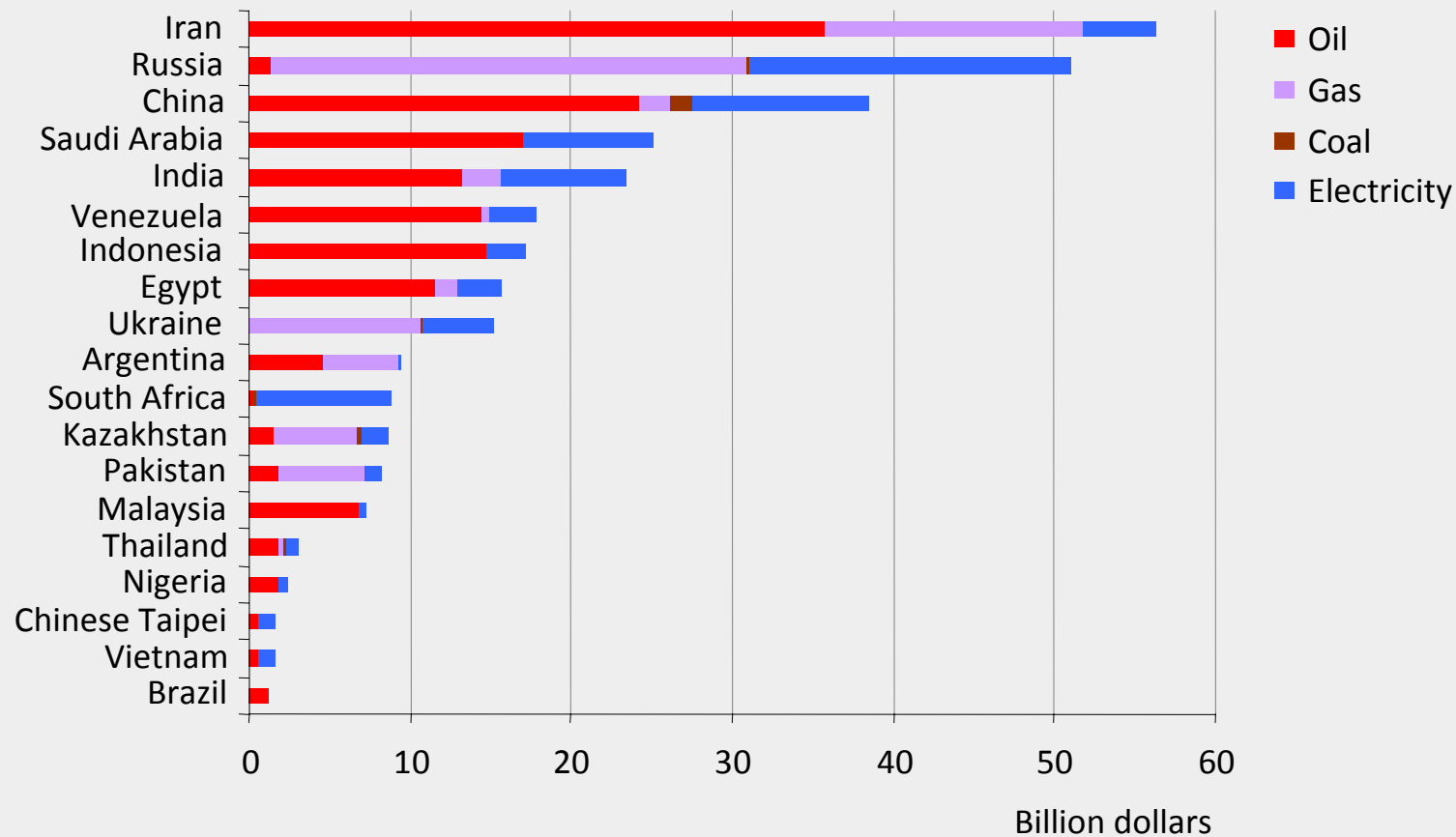
World
Energy
Outlook
2008



All of the growth in oil demand comes from non-OECD, with China contributing 43%, the Middle East & India each about 20% & other emerging Asian economies most of the rest

Energy subsidies in non-OECD countries, 2007

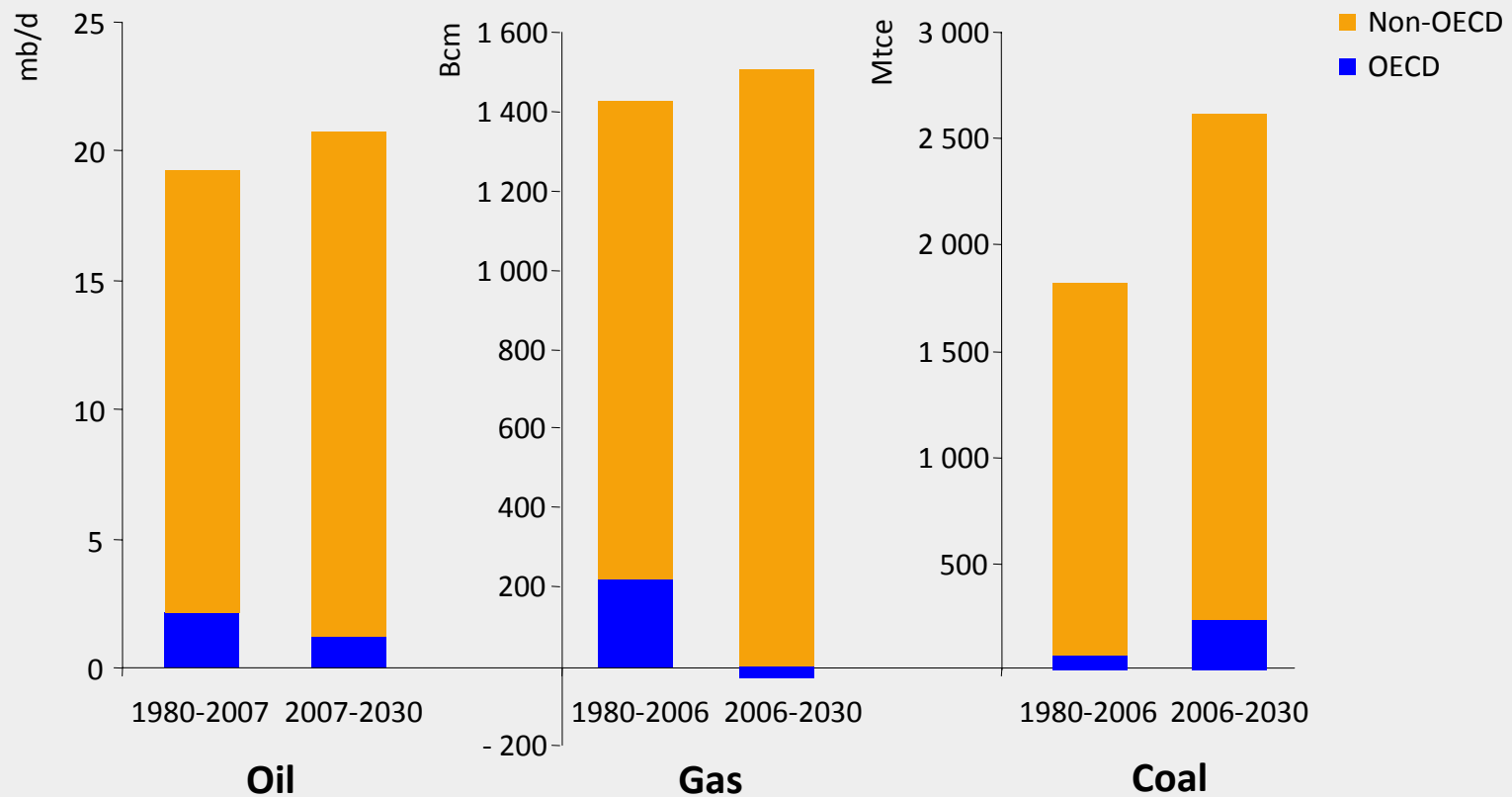
World
Energy
Outlook
2008



Energy subsidies in the 20 largest non-OECD countries hit \$310 billion in 2007 – creating, in many cases, an unsustainable economic burden & exacerbating environmental effects

Incremental world fossil-fuel production in the Reference Scenario

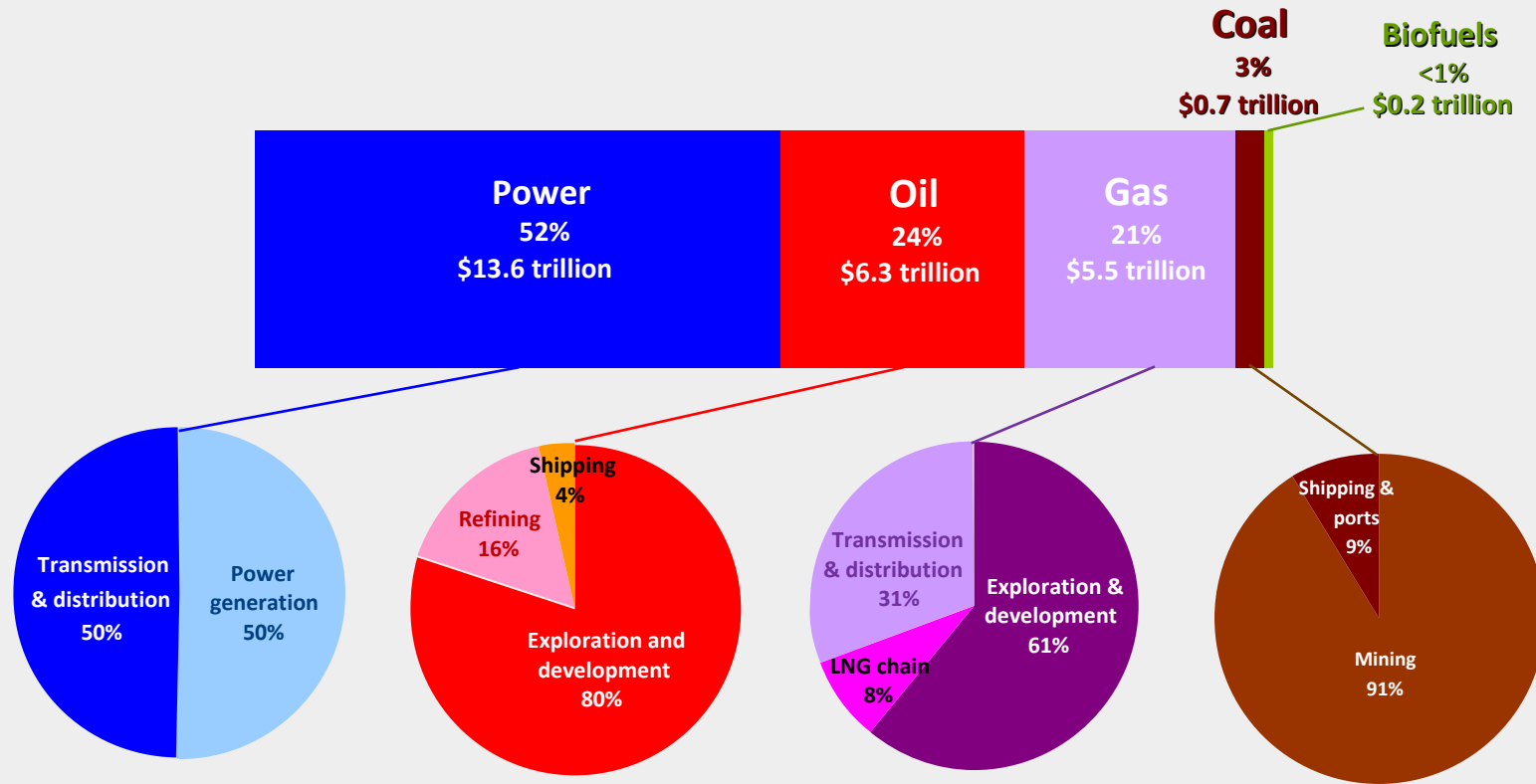
World
Energy
Outlook
2008



Almost all incremental oil & gas comes from non-OECD regions, resulting in major structural changes to the industry with implications for global energy markets

Cumulative energy-supply investment in the Reference Scenario, 2007-2030

World Energy Outlook 2008

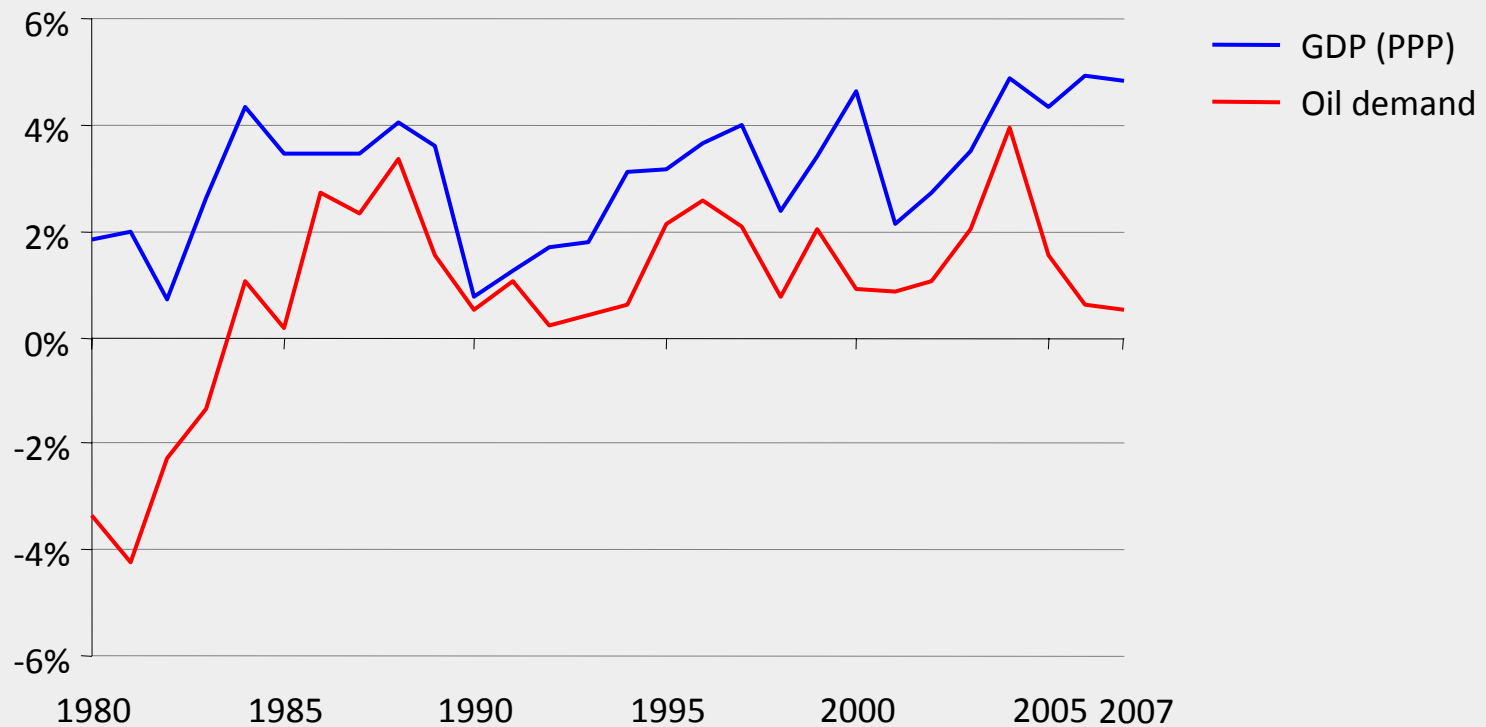


Investment of \$26 trillion, or over \$1 trillion/year, is needed, but the credit squeeze could delay spending, potentially setting up a supply-crunch once the economy recovers

Oil supply prospects

Change in world primary oil demand & real GDP growth

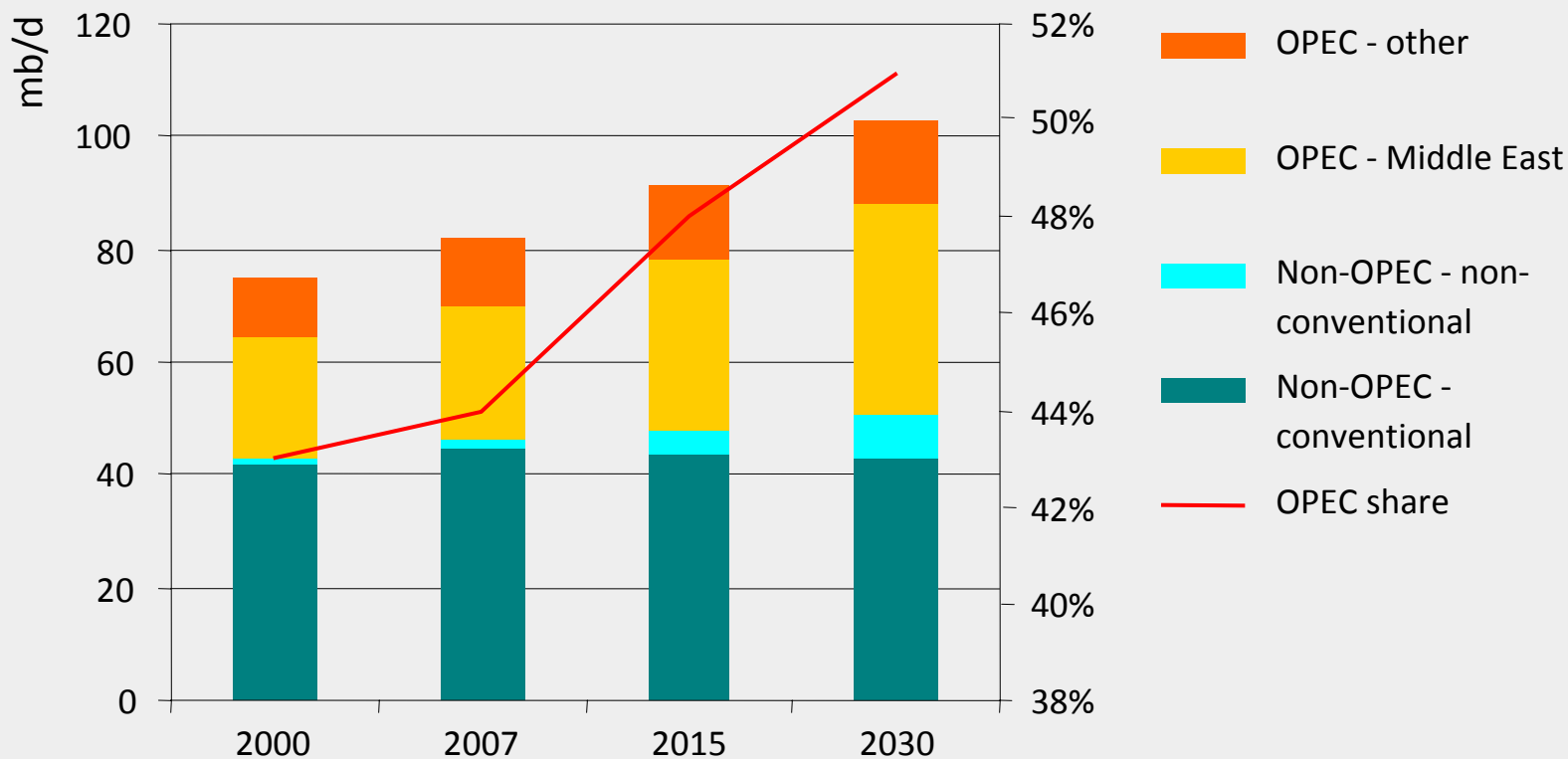
World
Energy
Outlook
2008



Global economic slowdown will surely cause oil demand to stall in near term, tempered only slightly by recent fall-back in prices

World oil production by OPEC/non-OPEC in the Reference Scenario

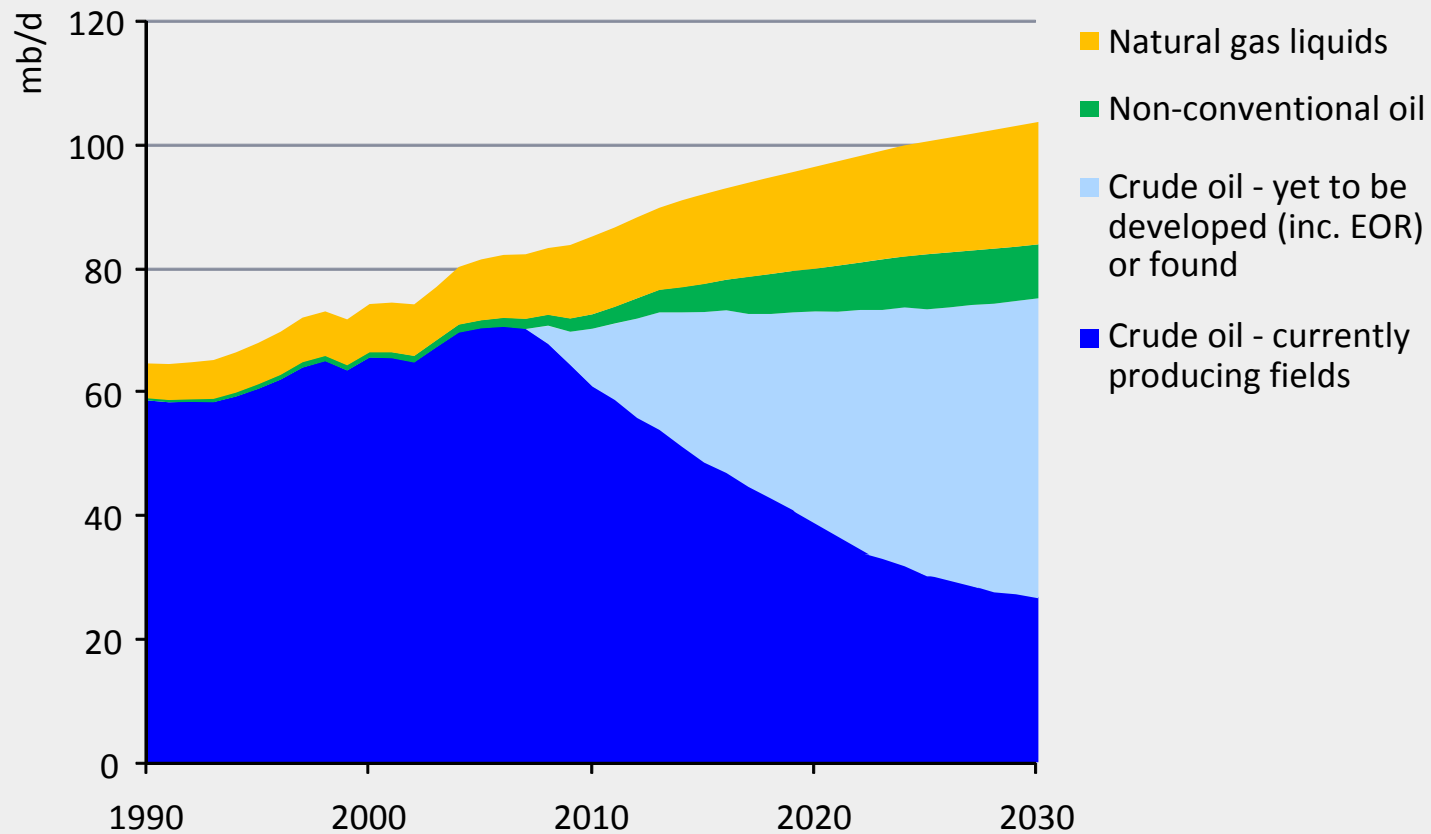
World
Energy
Outlook
2008



Production rises to 104 mb/d in 2030, with Middle East OPEC taking the lion's share of oil market growth as conventional non-OPEC production declines

World oil production by source in the Reference Scenario

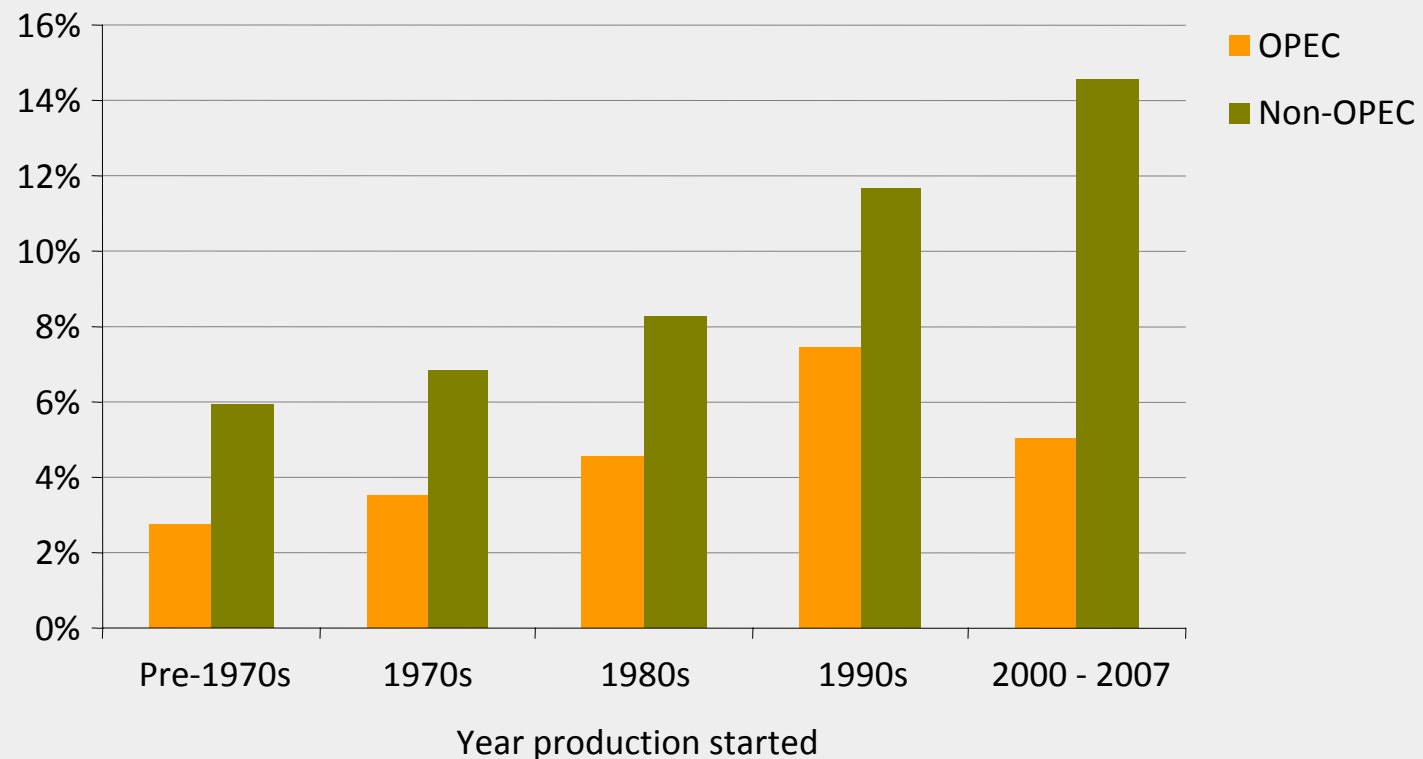
World
Energy
Outlook
2008



64 mb/d of gross capacity needs to be installed between 2007 & 2030 – six times the current capacity of Saudi Arabia – to meet demand growth & offset decline

Average observed oilfield decline rates

World
Energy
Outlook
2008

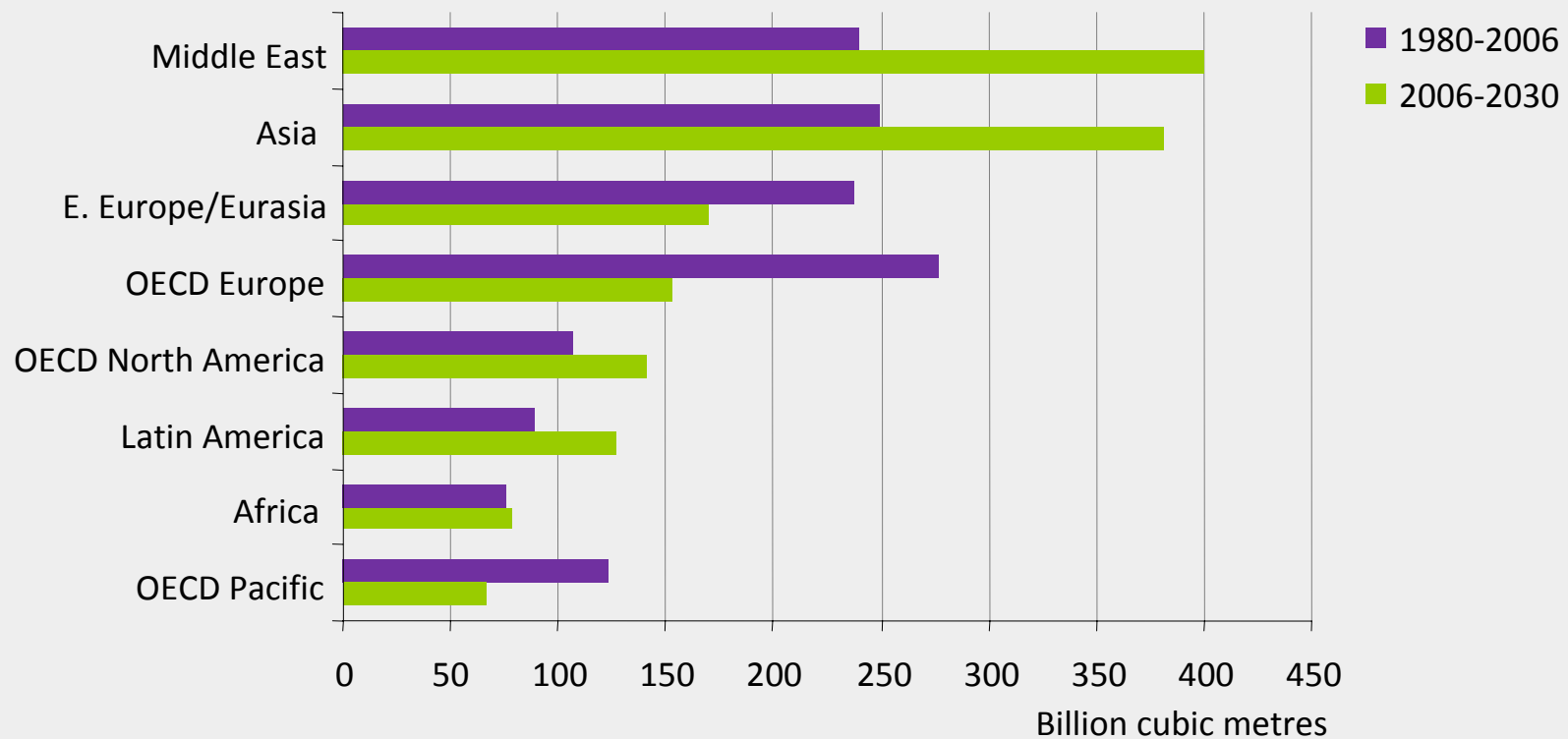


The production-weighted average decline rate worldwide is projected to rise from 6.7% in 2007 to 8.6% in 2030 as productions shifts to smaller oilfields, which tend to decline faster

Natural gas market outlook

The Reference Scenario: Increase in primary gas demand

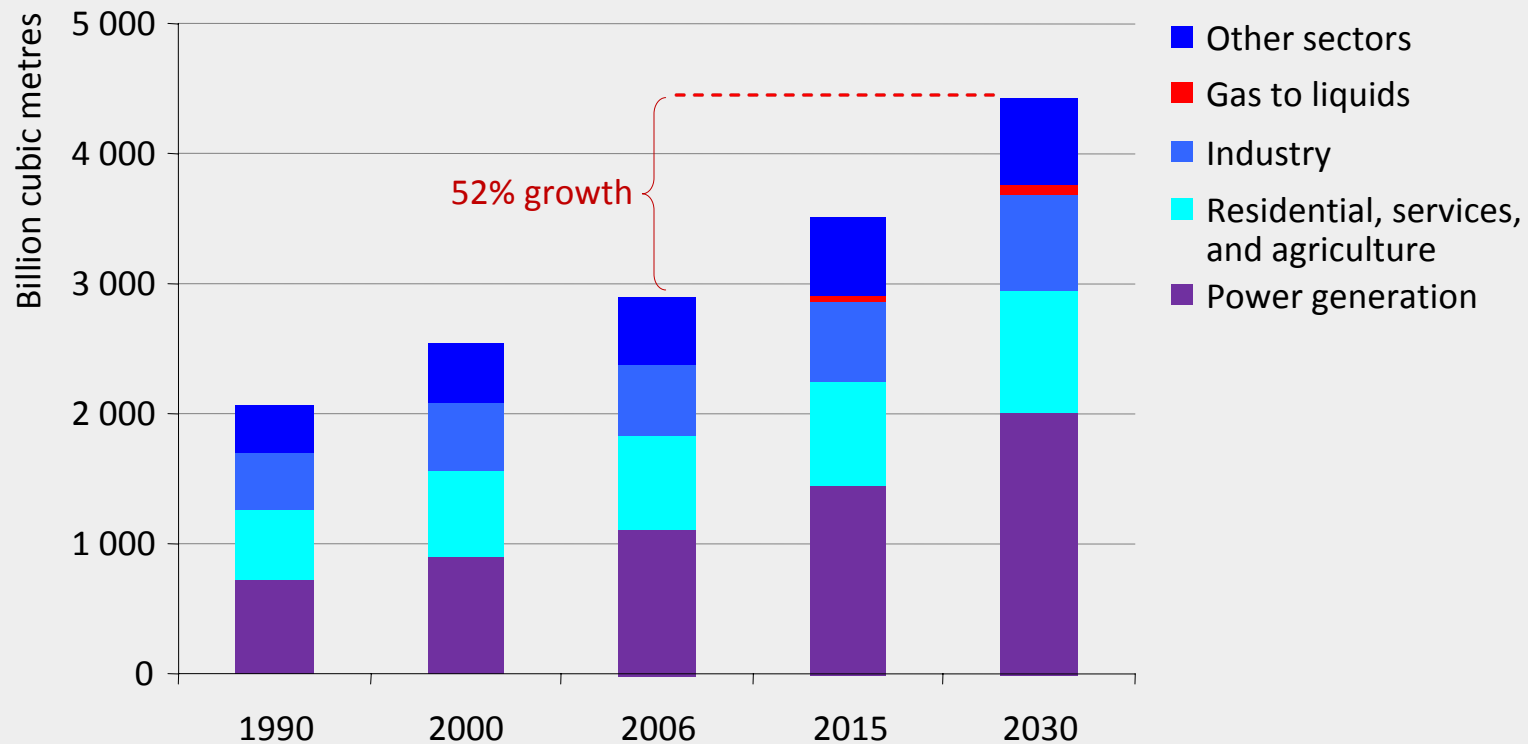
World
Energy
Outlook
2008



The bulk of the increase in global gas use — 76% in total — comes from non-OECD regions, where the bulk of remaining gas resources are found

The Reference Scenario: World primary natural gas demand

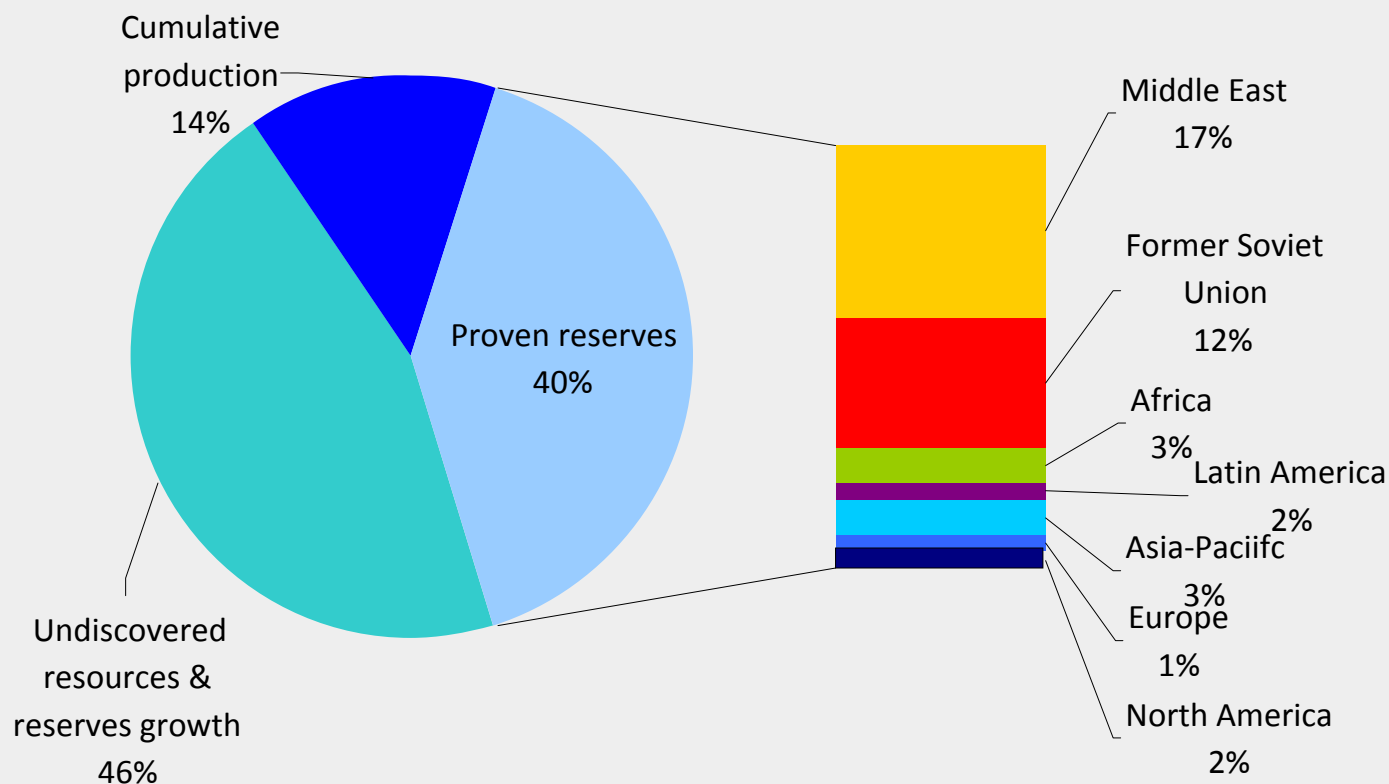
World
Energy
Outlook
2008



World primary demand for natural gas is projected to expand by just over half between 2006 & 2030 to 4.4 trillion cubic metres, a rate of increase of 1.8% per year

Ultimately recoverable conventional natural gas resources

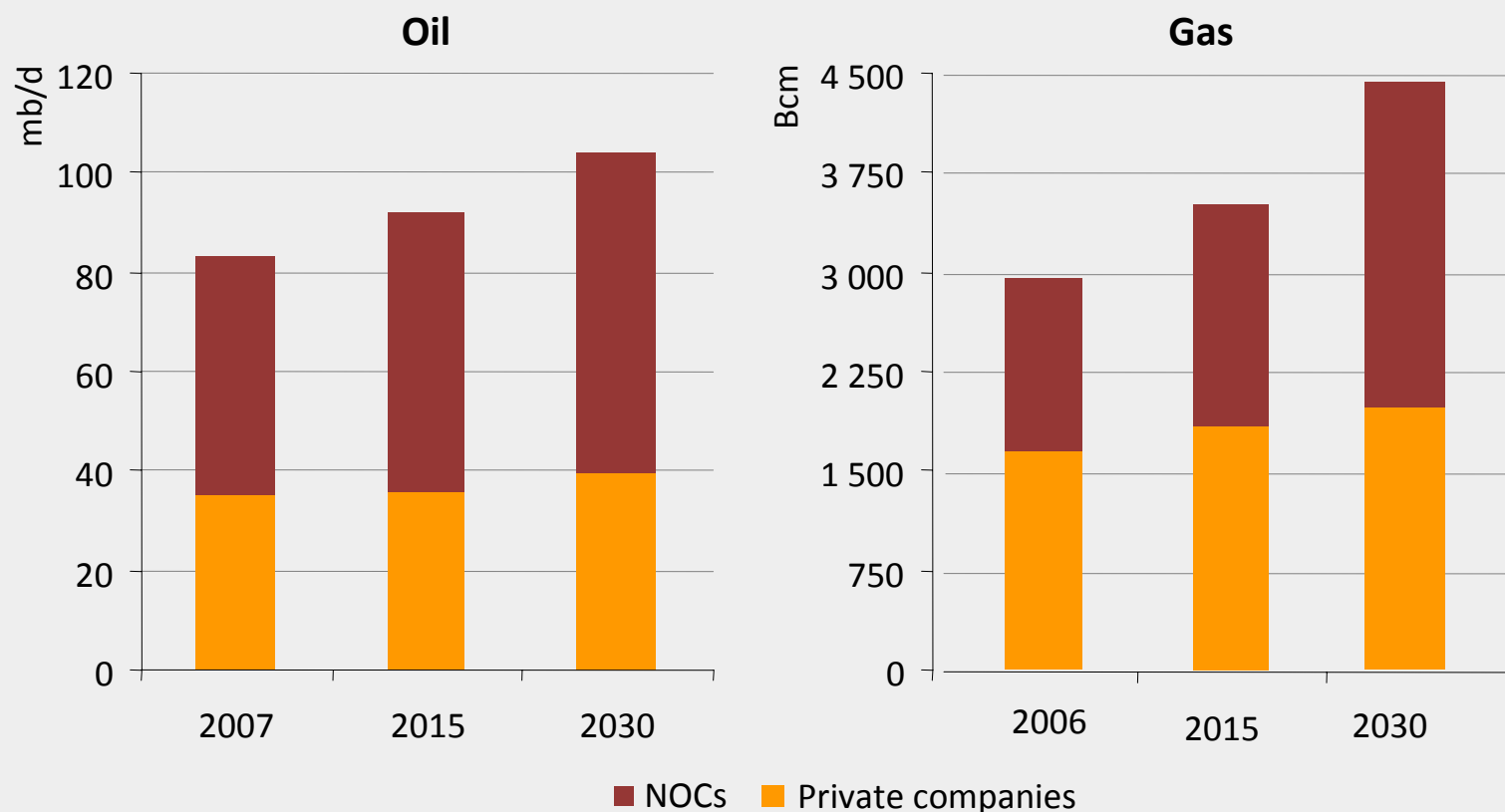
World
Energy
Outlook
2008



A mere 13% of estimated gas resources have so far been produced, while 40% have already been proven – most of them in the Middle East and the FSU

World oil & gas production by company type in the Reference Scenario

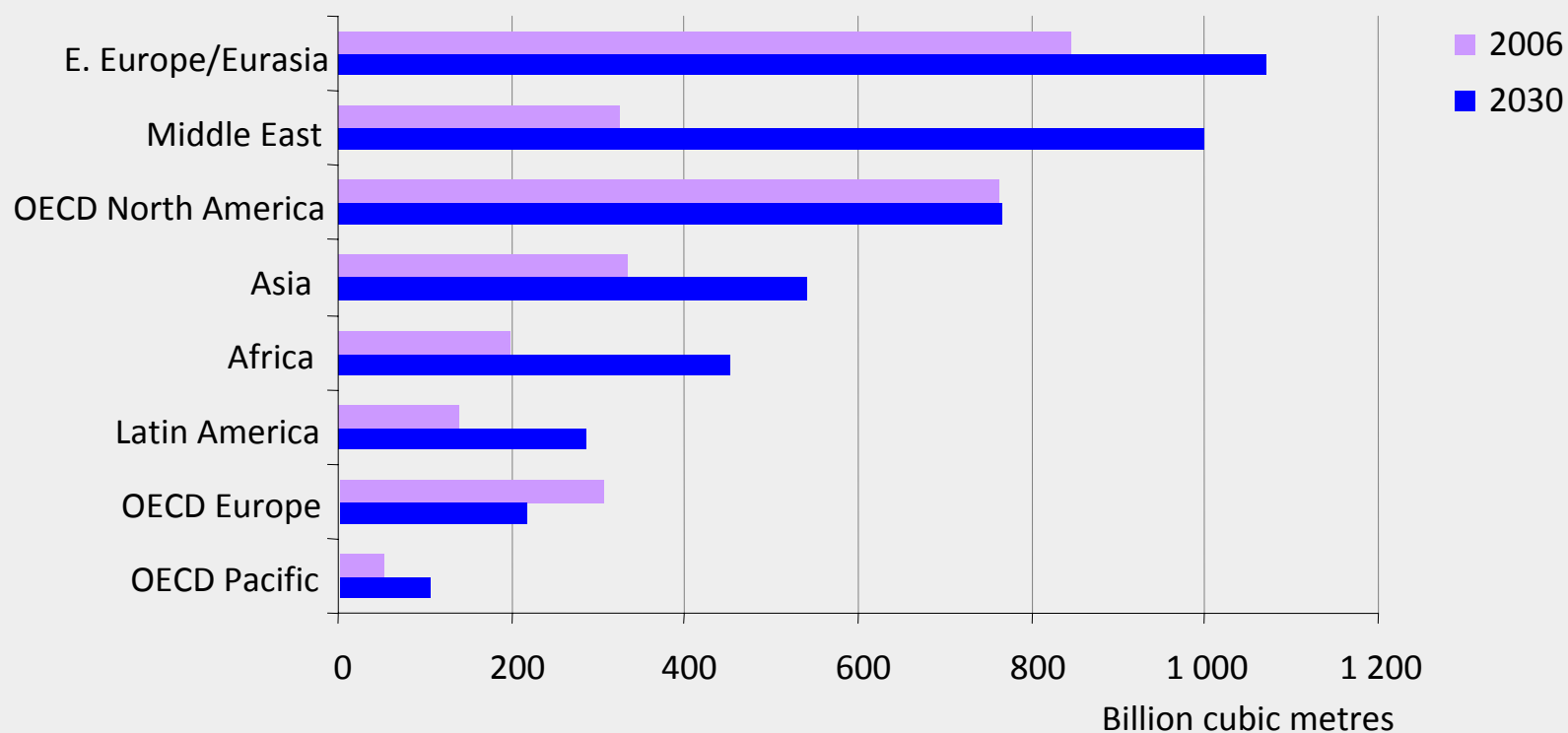
World
Energy
Outlook
2008



Almost 80% of the projected increase in output of oil & gas comes from national oil companies – assuming that investment is forthcoming

Natural gas production in the Reference Scenario

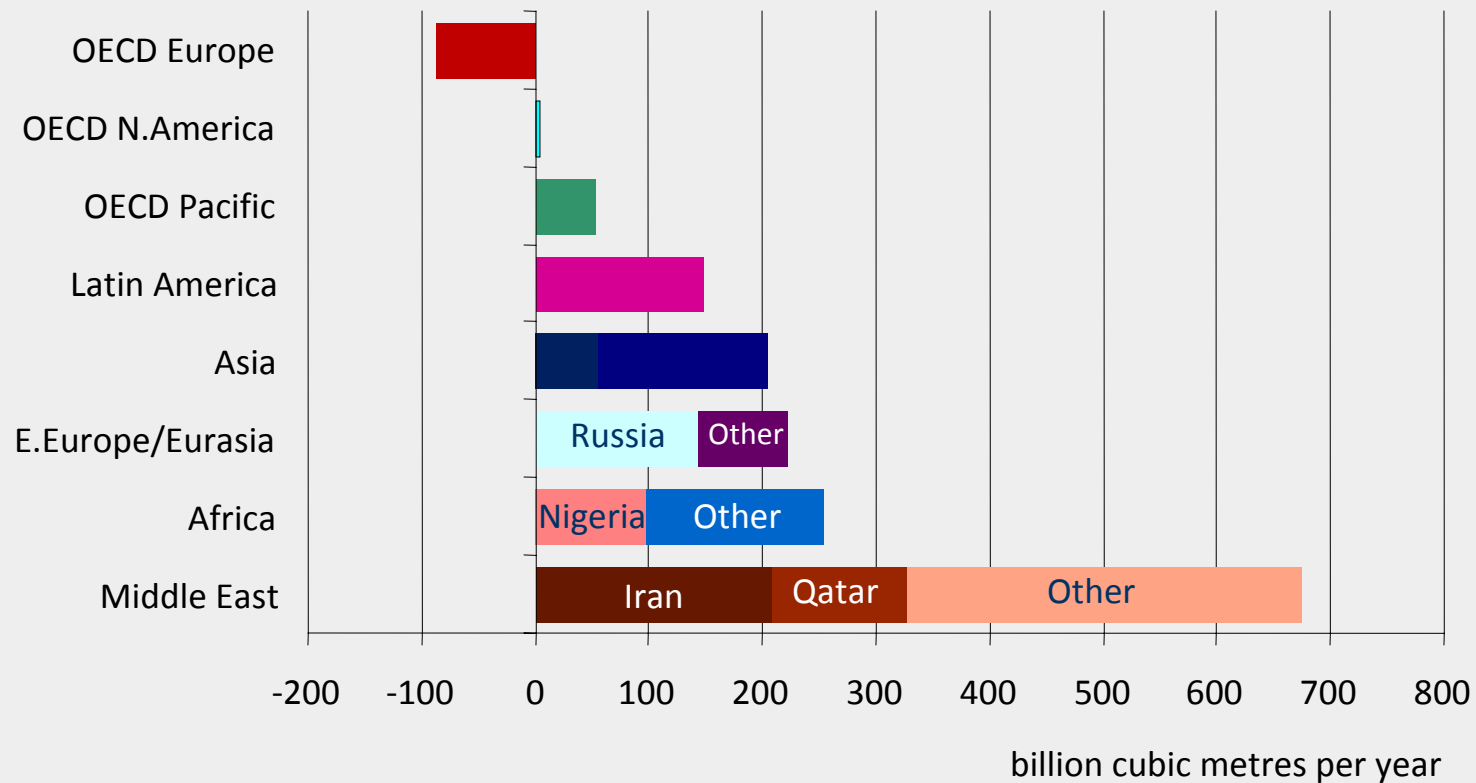
World
Energy
Outlook
2008



Gas production is set to become concentrated in the most resource-rich regions, with 46% of the growth to 2030 coming from the Middle East, its output tripling to over 1 tcm

Incremental gas production by region in the Reference Scenario, 2007-2030

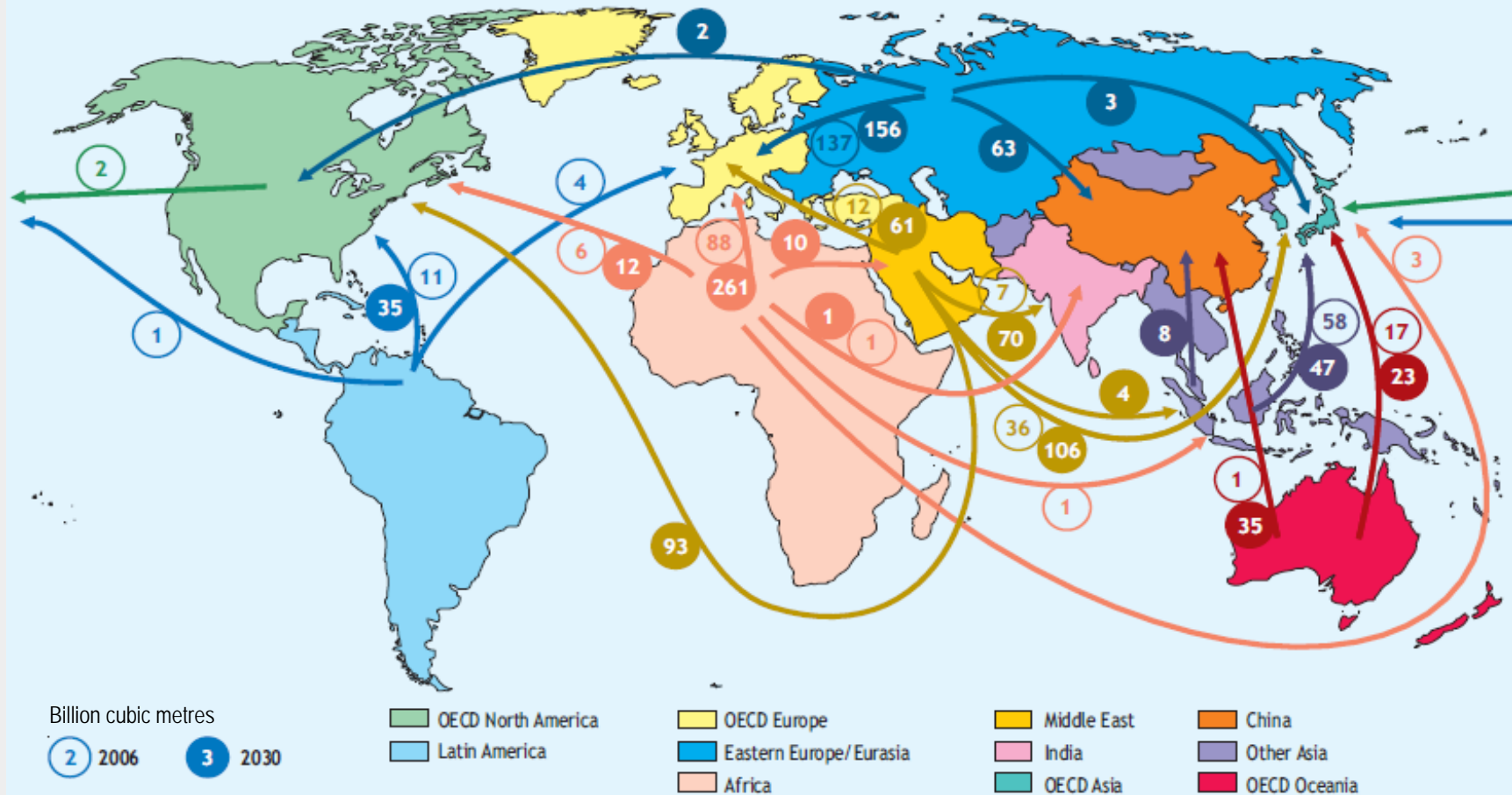
World
Energy
Outlook
2008



The Middle East – led by Iran and Qatar – contribute more than a third of the total projected increase in world gas production

Inter-regional gas trade flows in the Reference Scenario

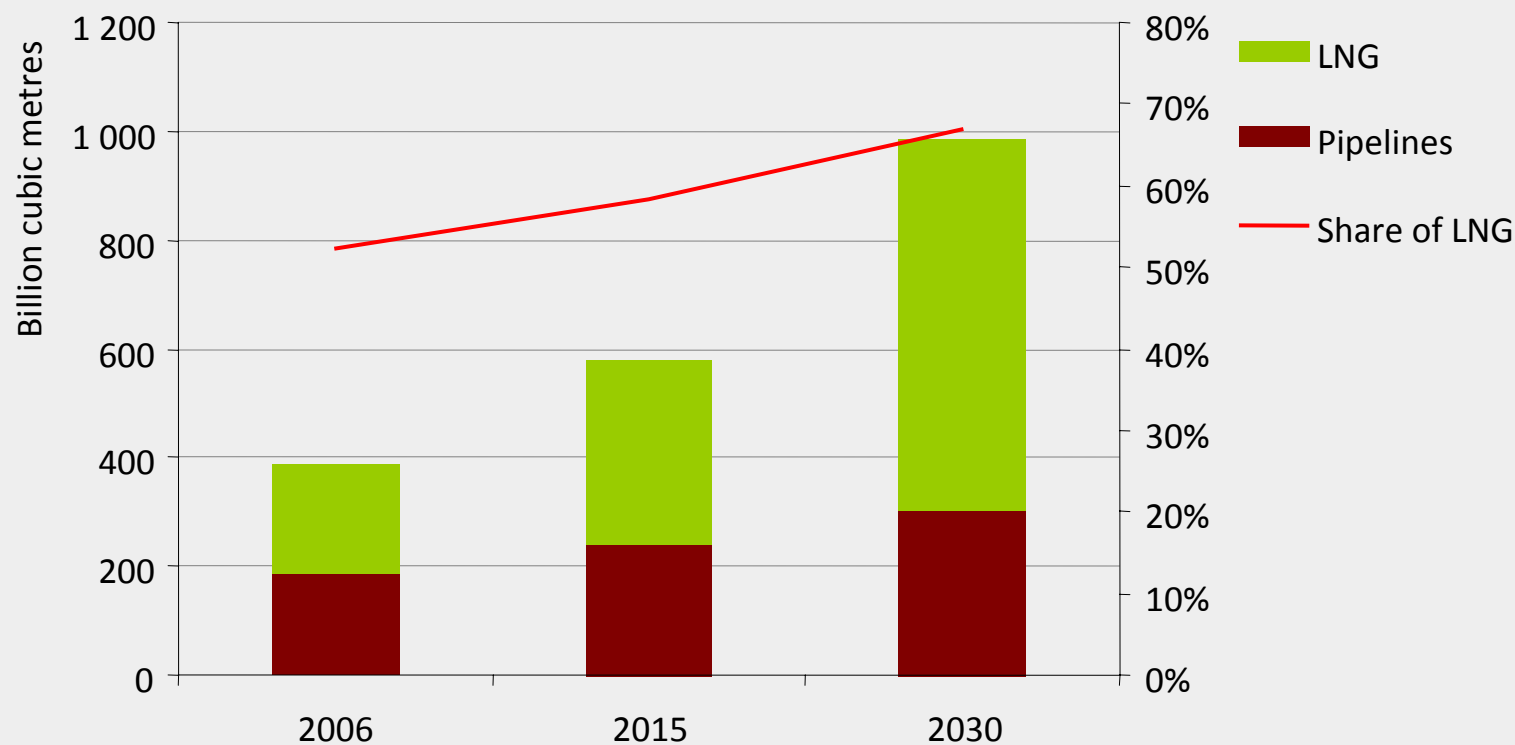
World Energy Outlook 2008



Inter-regional natural gas trade is projected to jump from 441 bcm in 2006 to around 1 tcm in 2030, with 3/4 of the increase coming from LNG

World inter-regional natural gas trade in the Reference Scenario

World
Energy
Outlook
2008

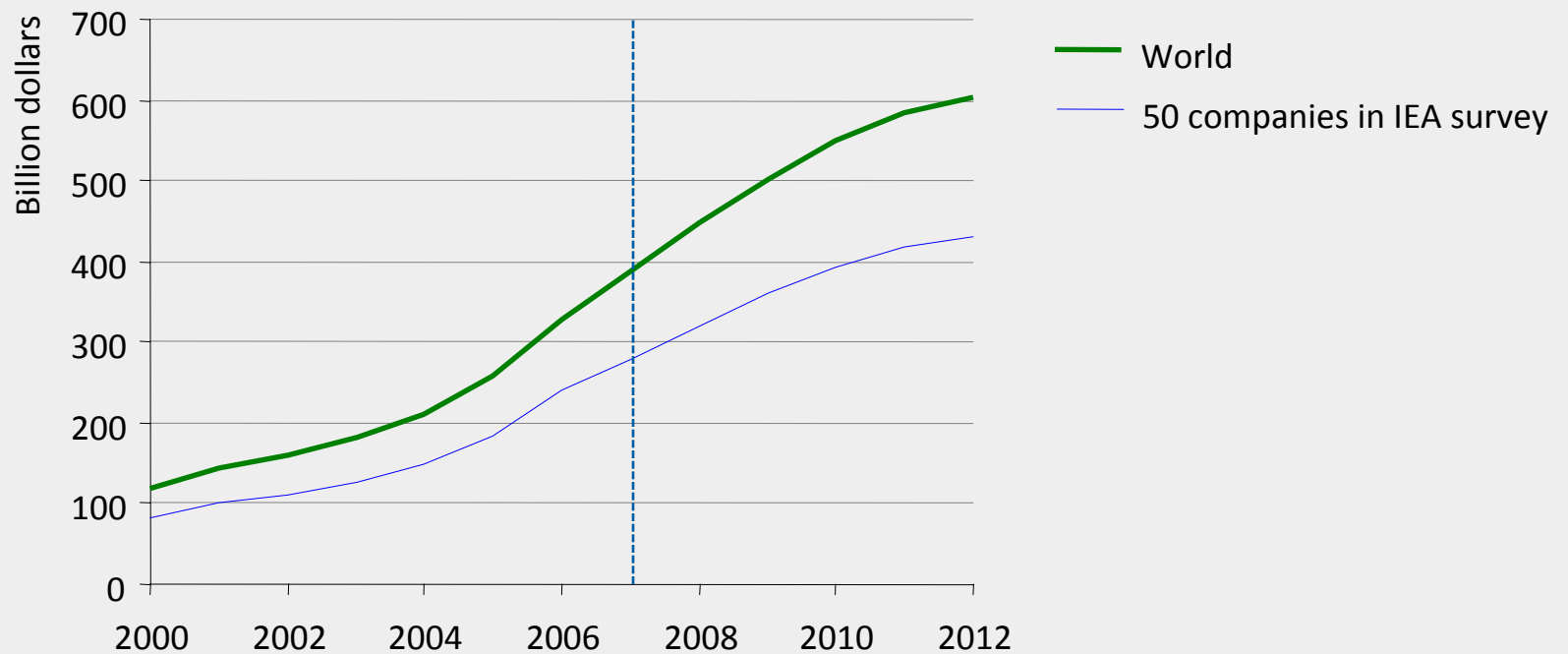


LNG trade surges from 201 bcm in 2006 to 340 bcm in 2015 & around 680 bcm in 2030, accounting for 76% of the global increase in inter-regional trade

Upstream investment outlook

World investment in upstream oil & gas – *historical & planned*

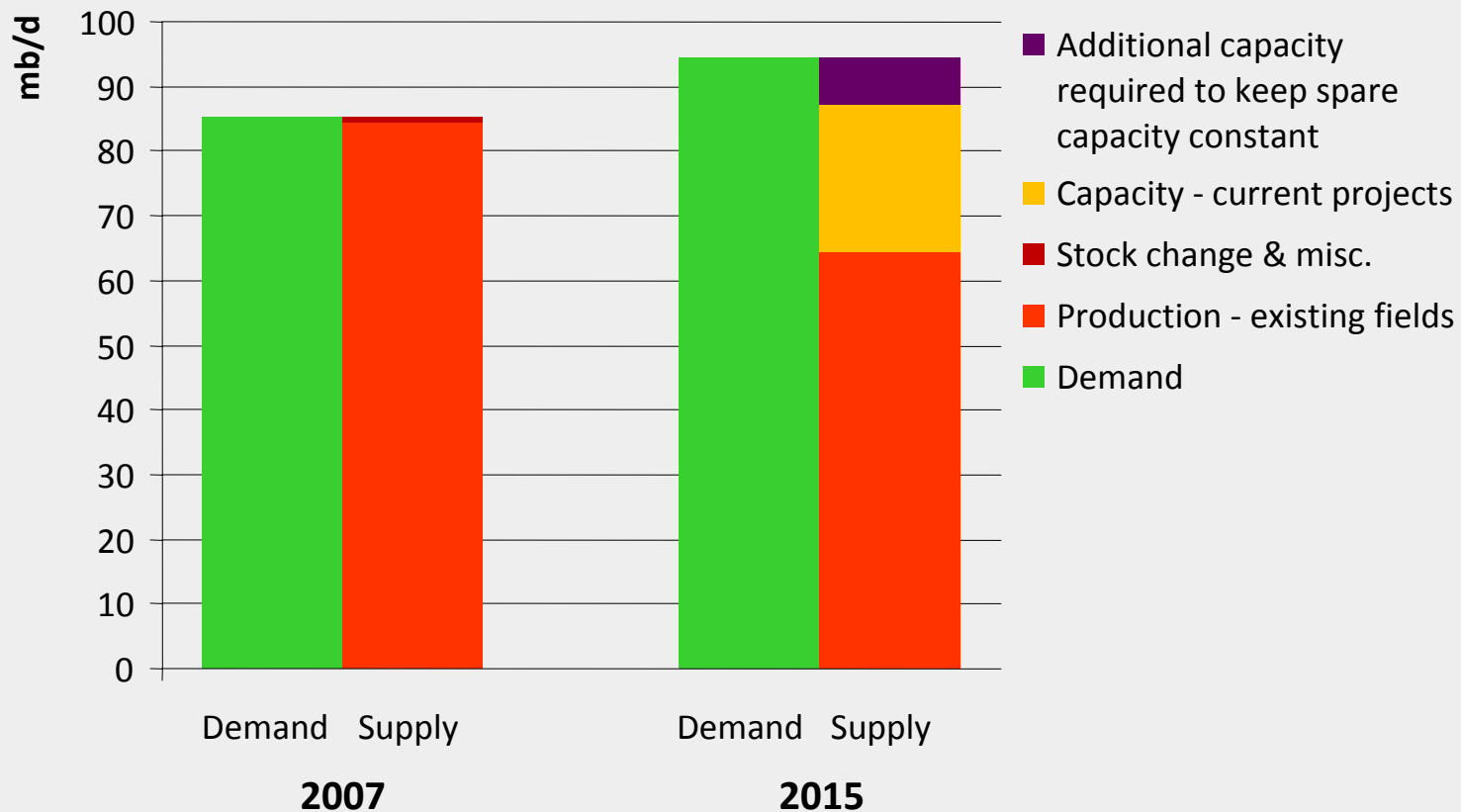
World
Energy
Outlook
2008



Total upstream investment more than tripled between 2000 & 2007, from an estimated \$120 billion to \$390 billion – mainly due to higher unit costs

Oil-production capacity additions & demand growth to 2015

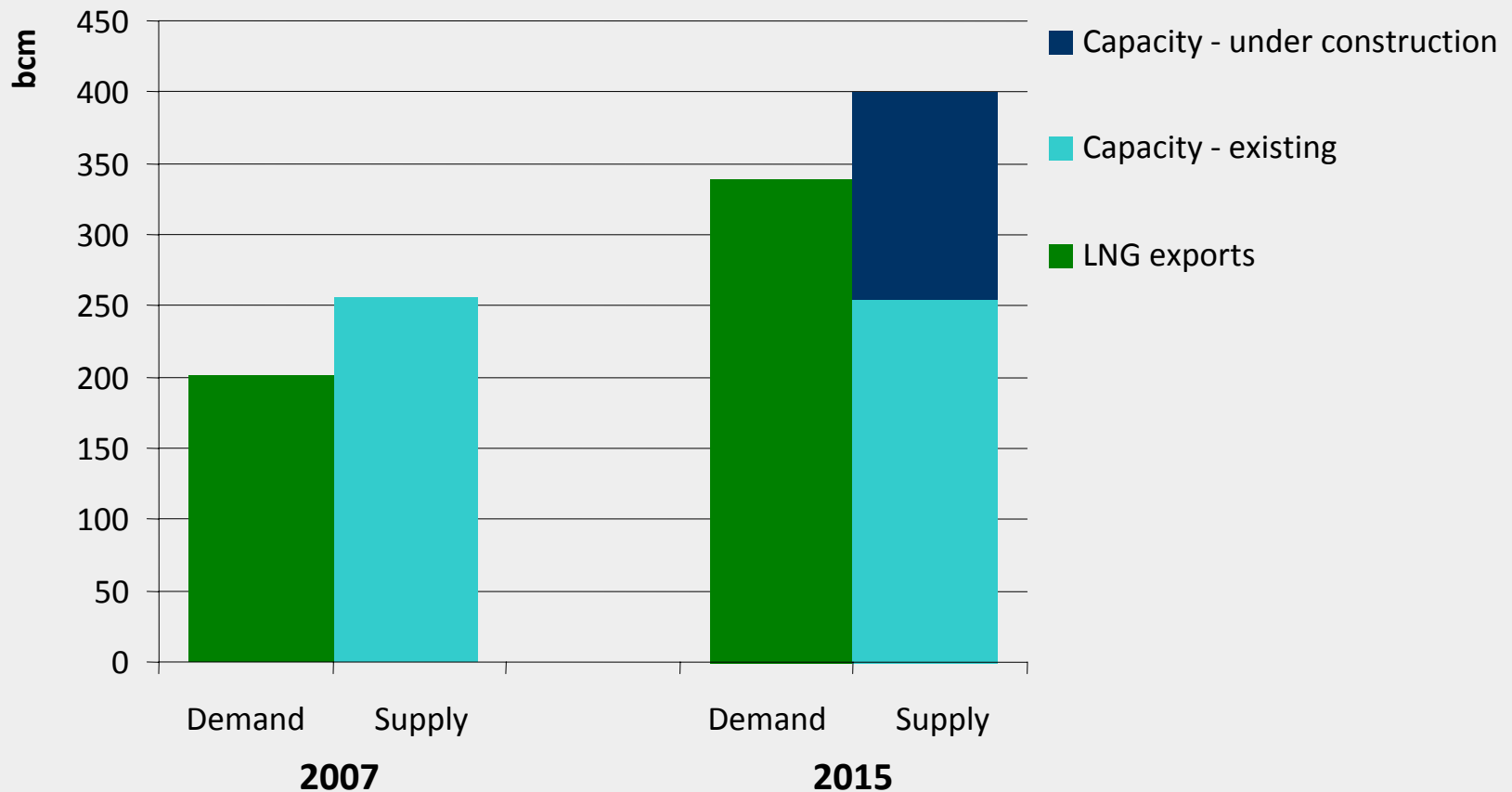
World
Energy
Outlook
2008



Current projects will add 23 mb/d of capacity by 2015 – assuming no new delays – so 7 mb/d of extra capacity will need to be sanctioned very soon to avert a supply crunch

LNG liquefaction capacity to 2015

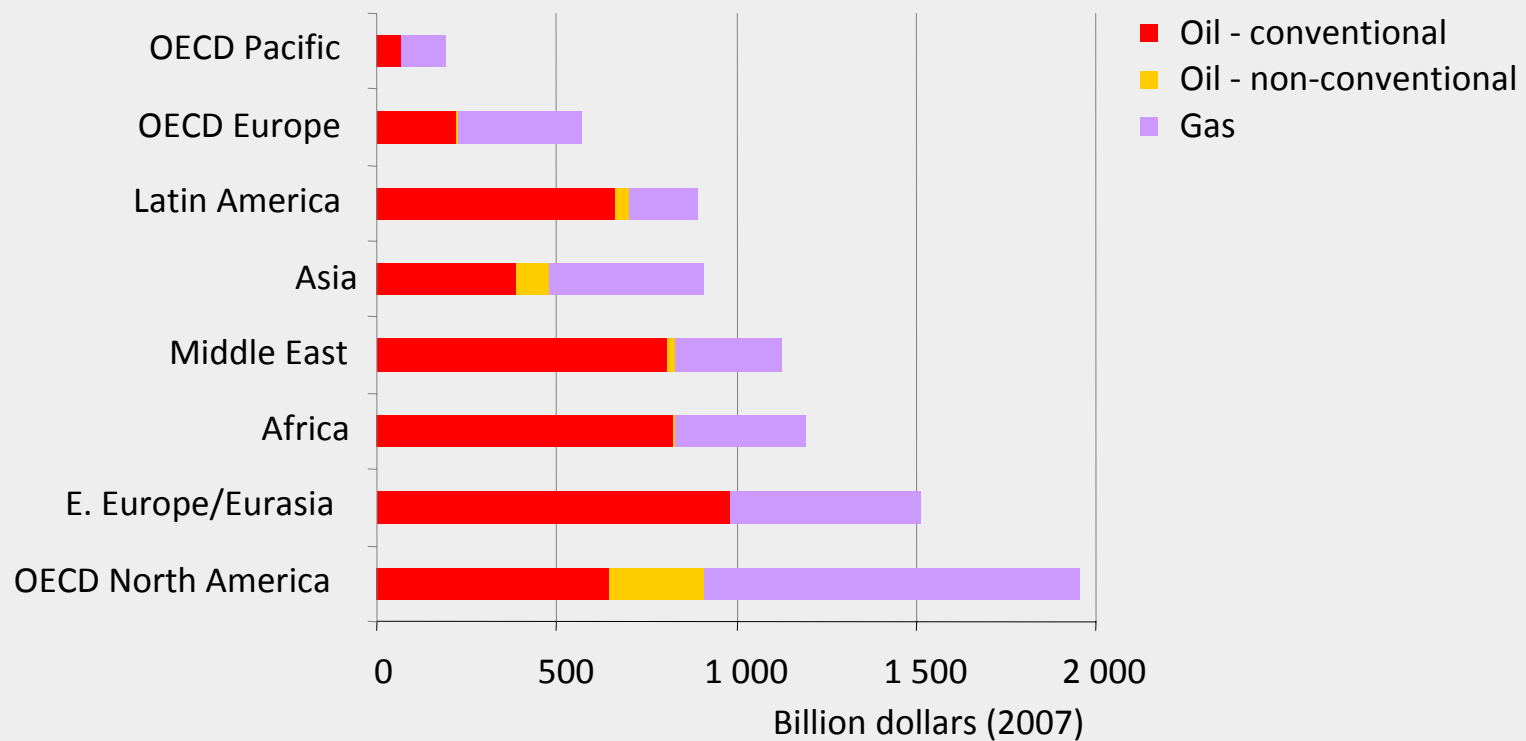
World
Energy
Outlook
2008



If there are no delays, liquefaction capacity is likely to be adequate in near term, but a dearth of new investment could lead to a squeeze mid next decade given long lead times

Cumulative upstream investment in the Reference Scenario, 2007-2030

World
Energy
Outlook
2008

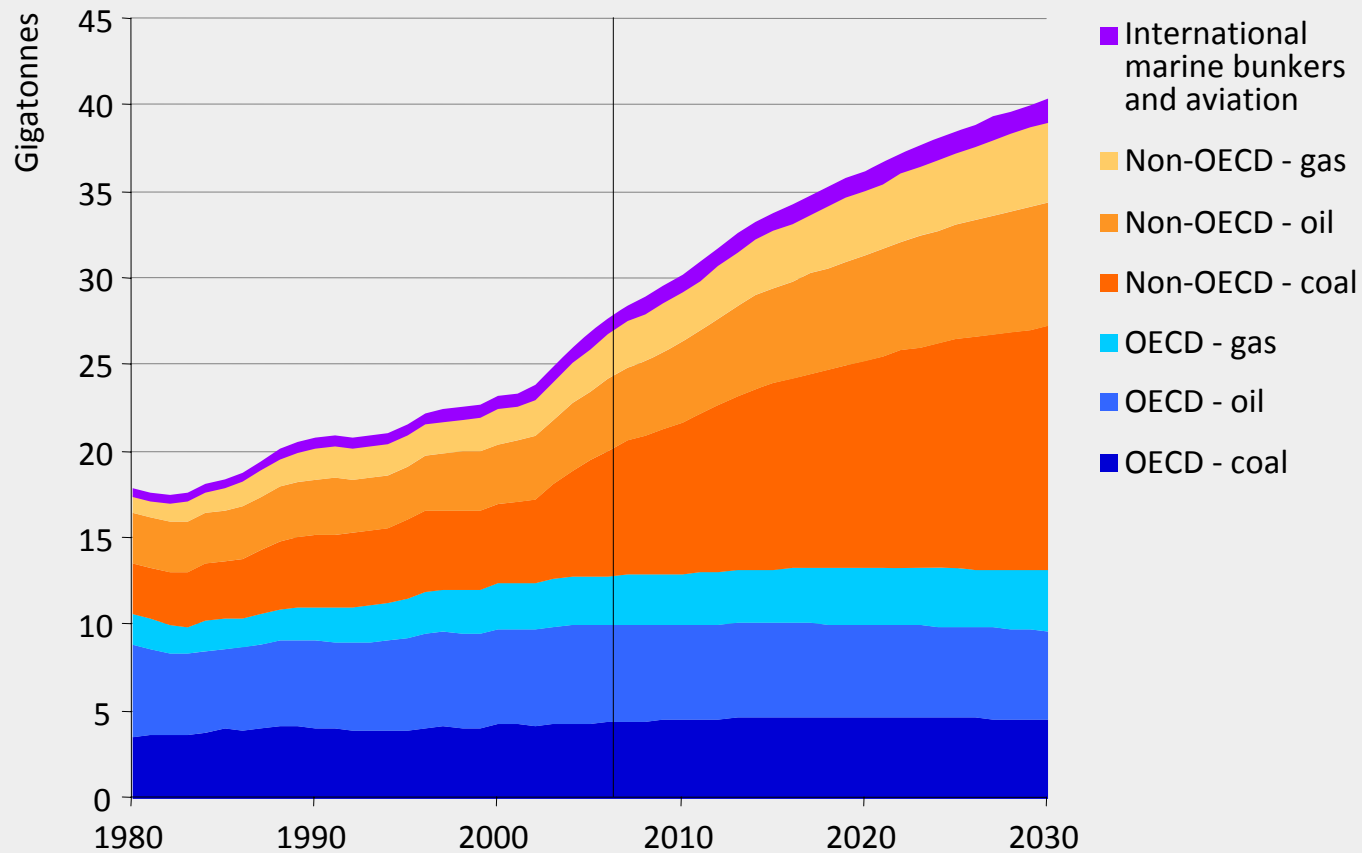


Total upstream investment totals \$8.4 trillion to 2030, or \$350 billion/year, led by North America where units costs are highest

Post-2012 climate-policy scenarios

Energy-related CO₂ emissions in the Reference Scenario

World
Energy
Outlook
2008

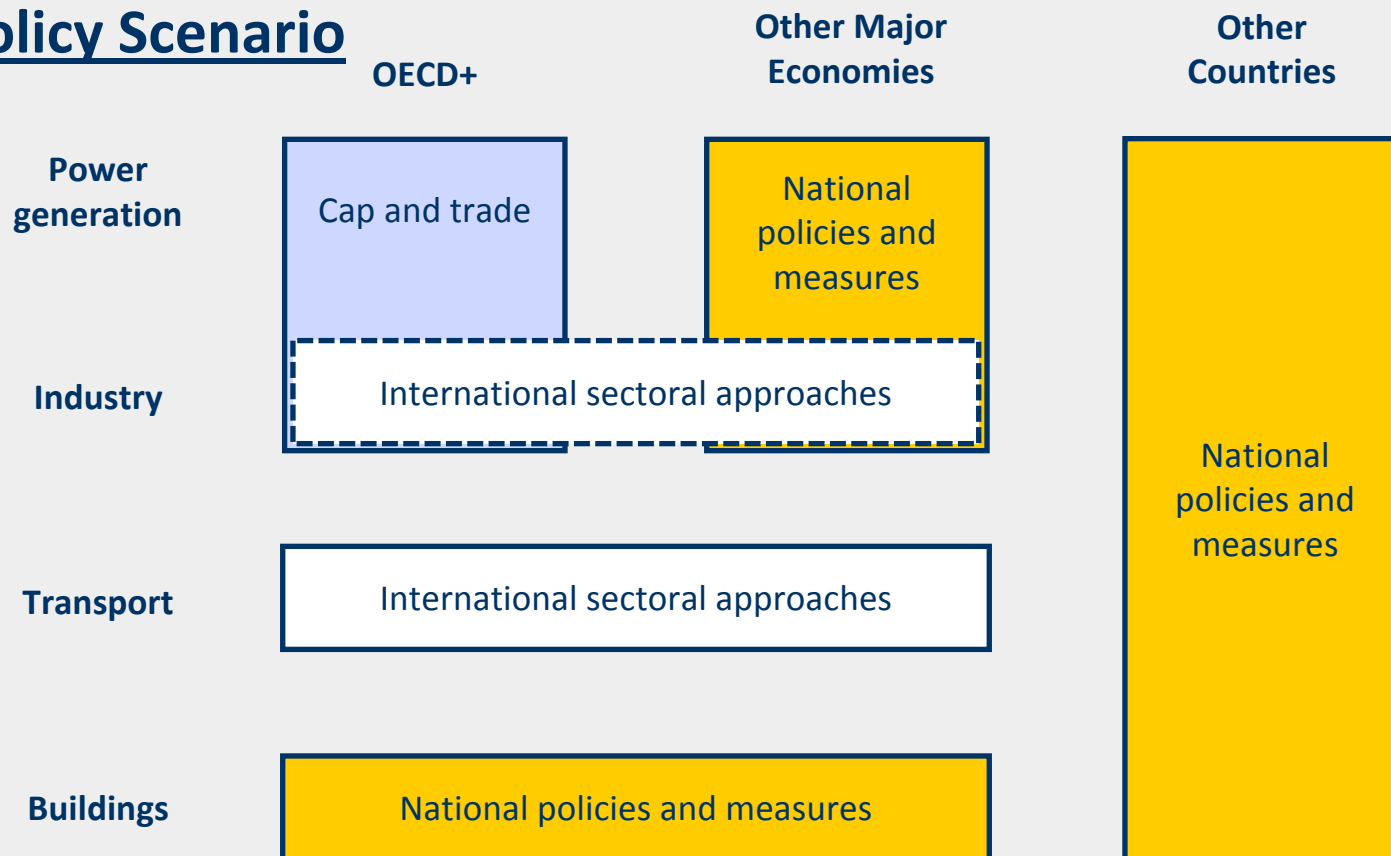


97% of the projected increase in emissions between now & 2030 comes from non-OECD countries – three-quarters from China, India & the Middle East alone

Copenhagen: a plausible post-2012 global climate-change policy regime

World
Energy
Outlook
2008

The 550 Policy Scenario

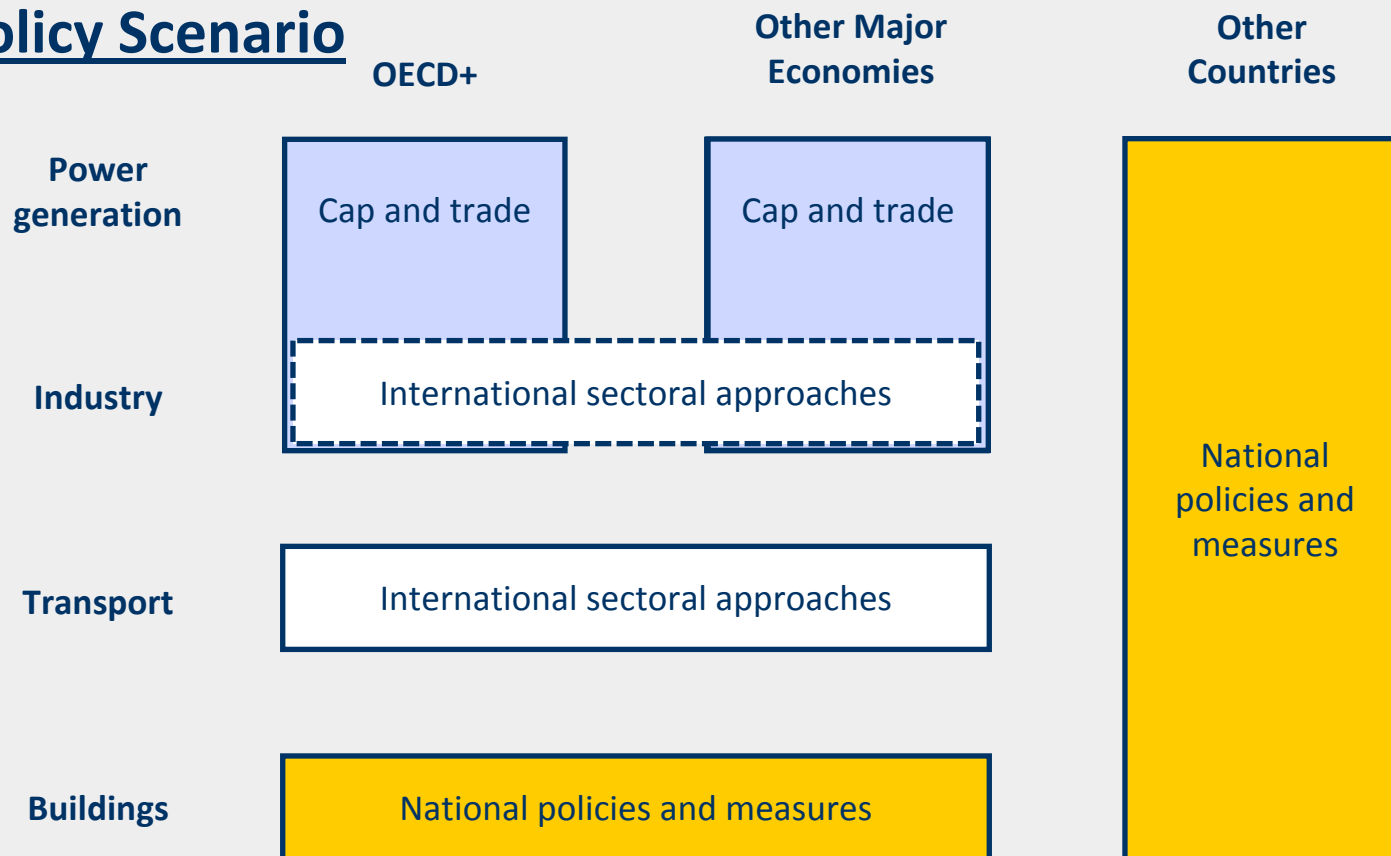


A combination of policy mechanisms – reflecting nations' varied circumstances & current negotiating positions – is a realistic outcome at the Copenhagen COP at end-2009

Copenhagen: a plausible post-2012 global climate-change policy regime

World
Energy
Outlook
2008

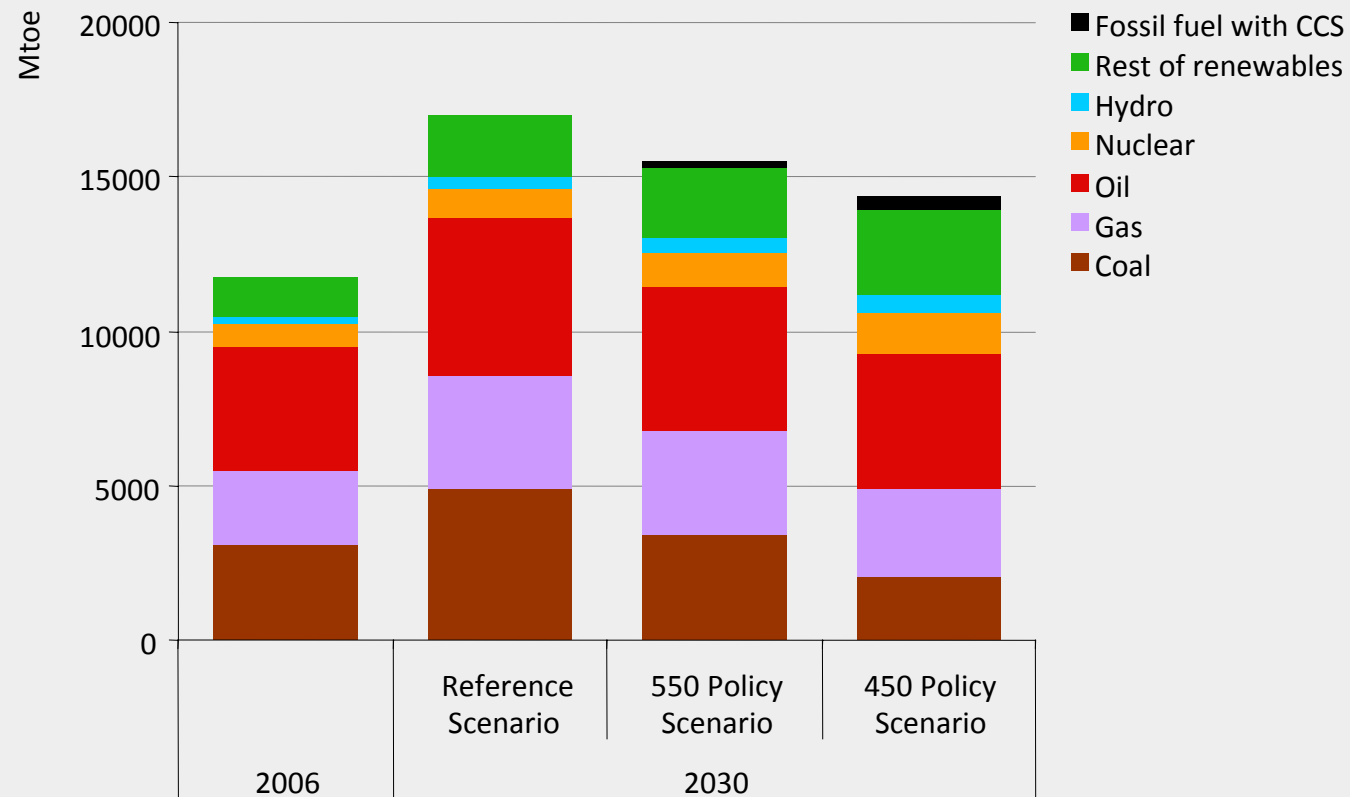
The 450 Policy Scenario



A combination of policy mechanisms – reflecting nations' varied circumstances & current negotiating positions – is a realistic outcome at the Copenhagen COP at end-2009

World primary energy demand in the climate-policy scenarios

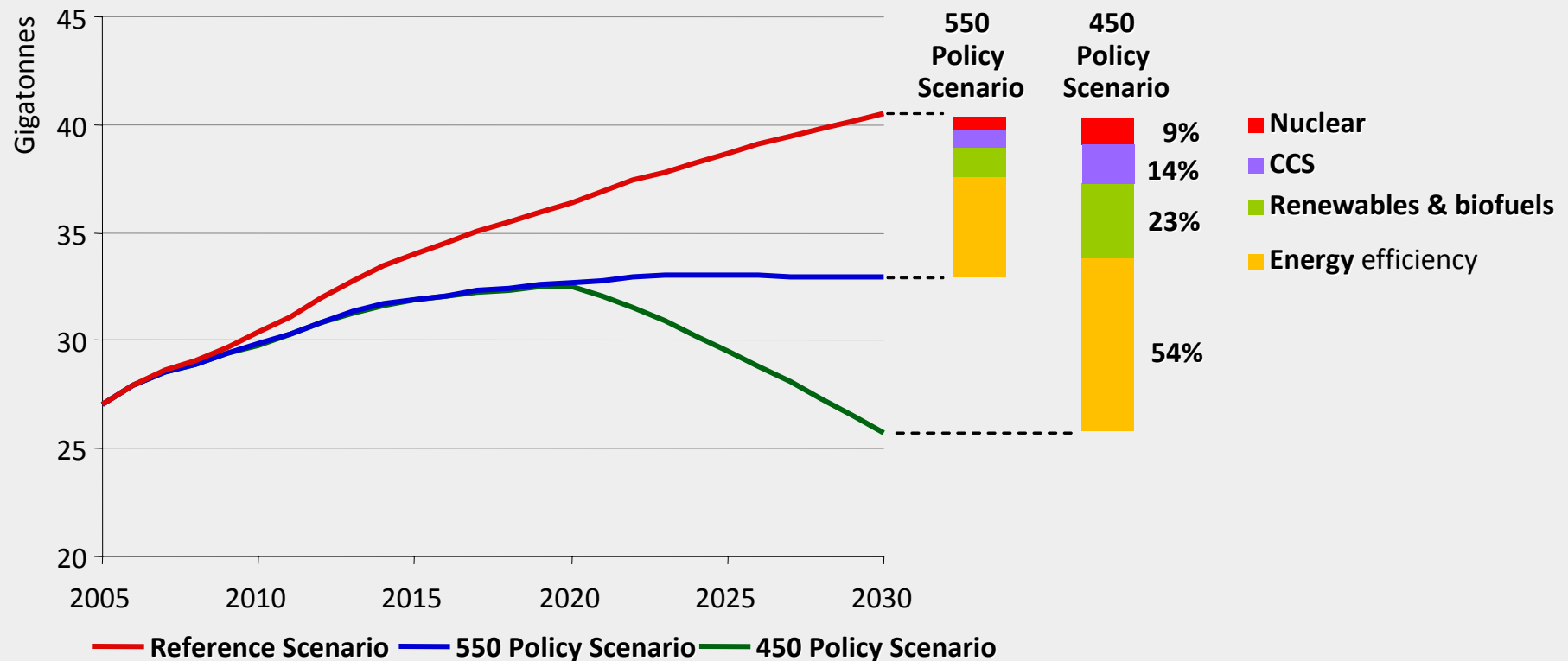
World
Energy
Outlook
2008



The transition to a low-carbon energy system hinges on radical action by governments — at national & local levels, and through co-ordinated international mechanisms

Reductions in energy-related CO₂ emissions in the climate-policy scenarios

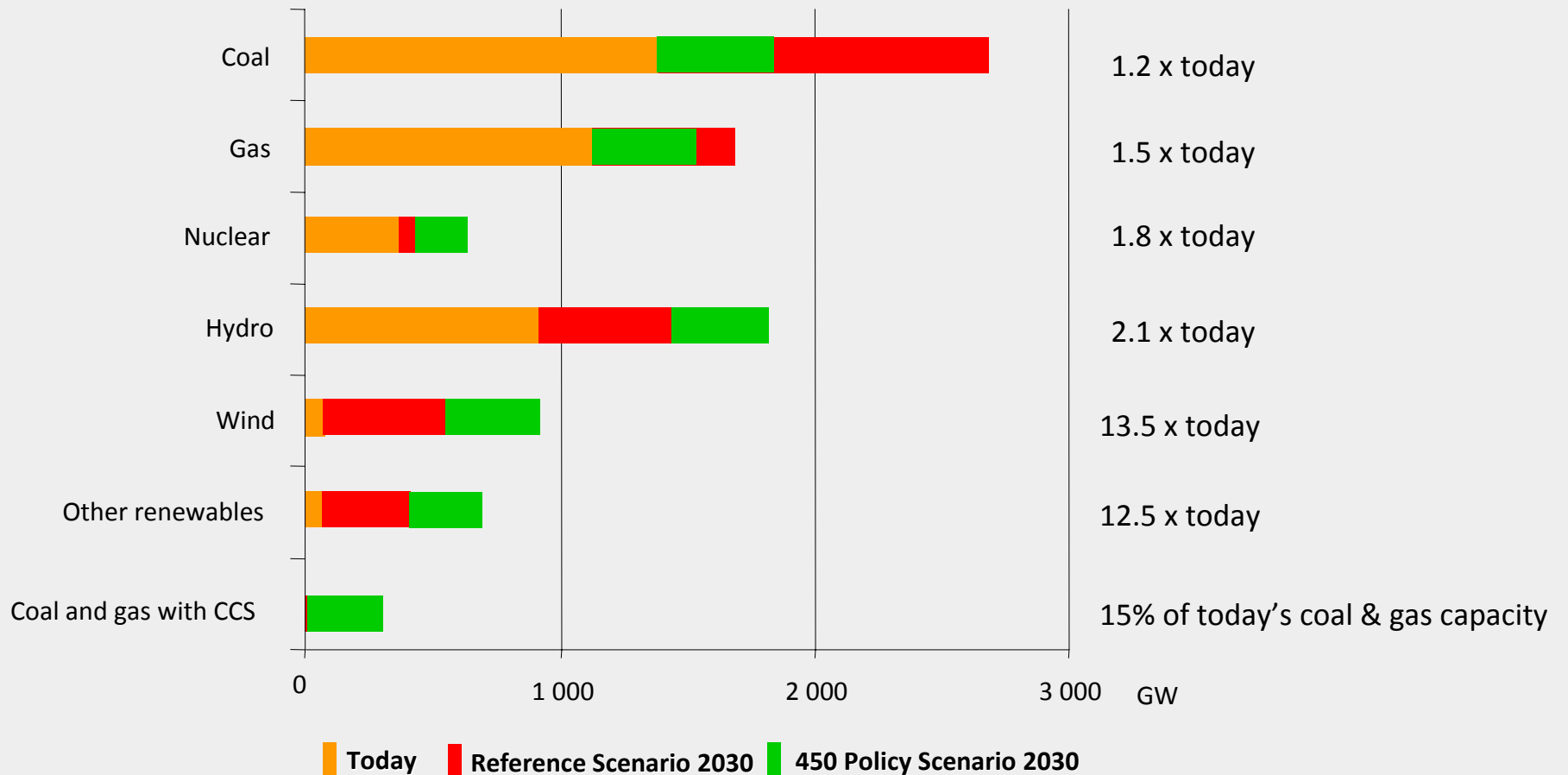
World
Energy
Outlook
2008



While technological progress is needed to achieve some emissions reductions, efficiency gains and deployment of existing low-carbon energy account for most of the savings

Total power generation capacity today and in 2030 by scenario

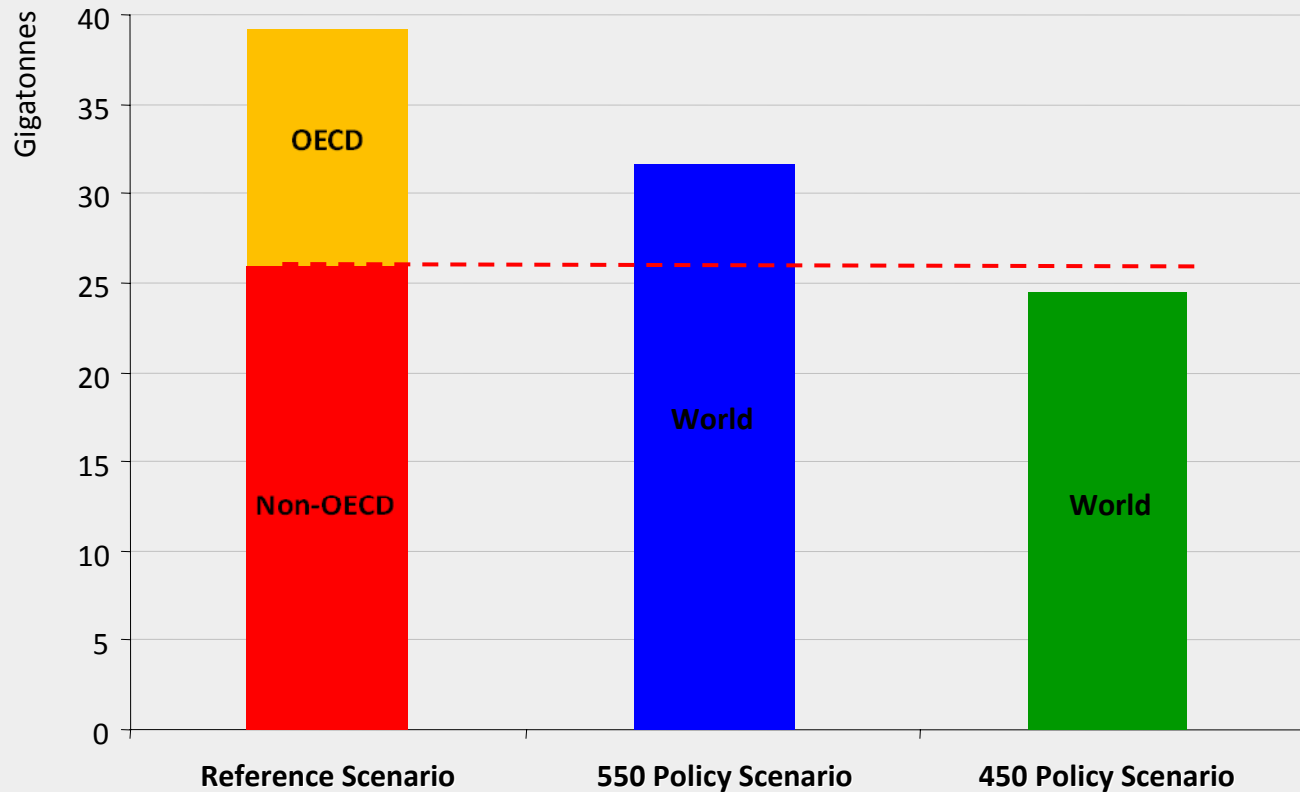
World
Energy
Outlook
2008



In the 450 Policy Scenario, the power sector undergoes a dramatic change – with CCS, renewables and nuclear each playing a crucial role

World energy-related CO₂ emissions in 2030 by scenario

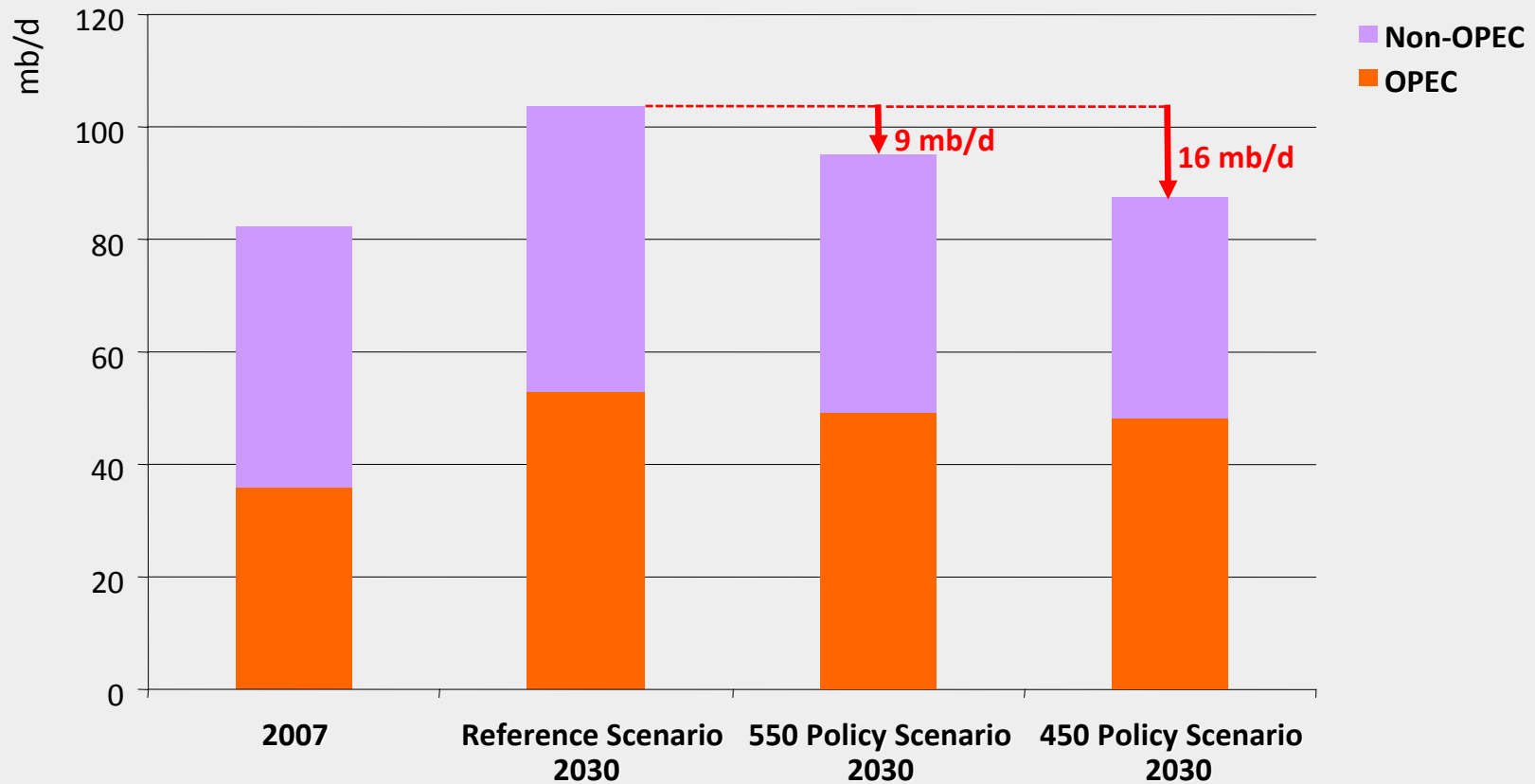
World
Energy
Outlook
2008



OECD countries alone cannot put the world onto a 450-ppm trajectory, even if they were to reduce their emissions to zero

Total oil production in 2030 by scenario

World
Energy
Outlook
2008



Curbing CO₂ emissions would improve energy security by cutting demand for fossil fuels, but even in the 450 Policy Scenario, OPEC production increases by 12 mb/d from now to 2030

Key results of the post-2012 climate-policy analysis

World
Energy
Outlook
2008

550 Policy Scenario

- Corresponds to ~ 3°C global temperature rise.
- Energy demand continues to expand, but fuel mix is markedly different.
- CO₂ price in OECD countries reaches \$90/tonne in 2030.
- Additional investment equal to 0.25% of GDP.

450 Policy Scenario

- Corresponds to a ~2°C global temperature rise.
- Energy demand grows, but half as fast as in Reference Scenario.
- Global CO₂ price reaches \$180/tonne in 2030.
- Additional investment equal to 0.6% of GDP.
- Rapid deployment of low-carbon technologies – particularly CCS.
- Big fall in non-OECD emissions.

Summary & conclusions

Summary & conclusions

World
Energy
Outlook
2008

- Current energy trends are patently unsustainable — socially, environmentally, economically
- Oil will remain the leading energy source but...
 - > *The era of cheap oil is over, although price volatility will remain*
 - > *Oilfield decline is the key determinant of investment needs*
 - > *The oil market is undergoing major and lasting structural change, with national companies in the ascendancy*
- To avoid "abrupt and irreversible" climate change we need a major decarbonisation of the world's energy system
 - > *Copenhagen must deliver a credible post-2012 climate regime*
 - > *Limiting temperature rise to ~2 °C will require significant emission reductions in all regions & technological breakthroughs*
 - > *Mitigating climate change will substantially improve energy security*
- The present global economic worries do not excuse back-tracking or delays in taking action to address energy challenges

Full report available from

www.iea.org

Publications