



World Energy Outlook 2006

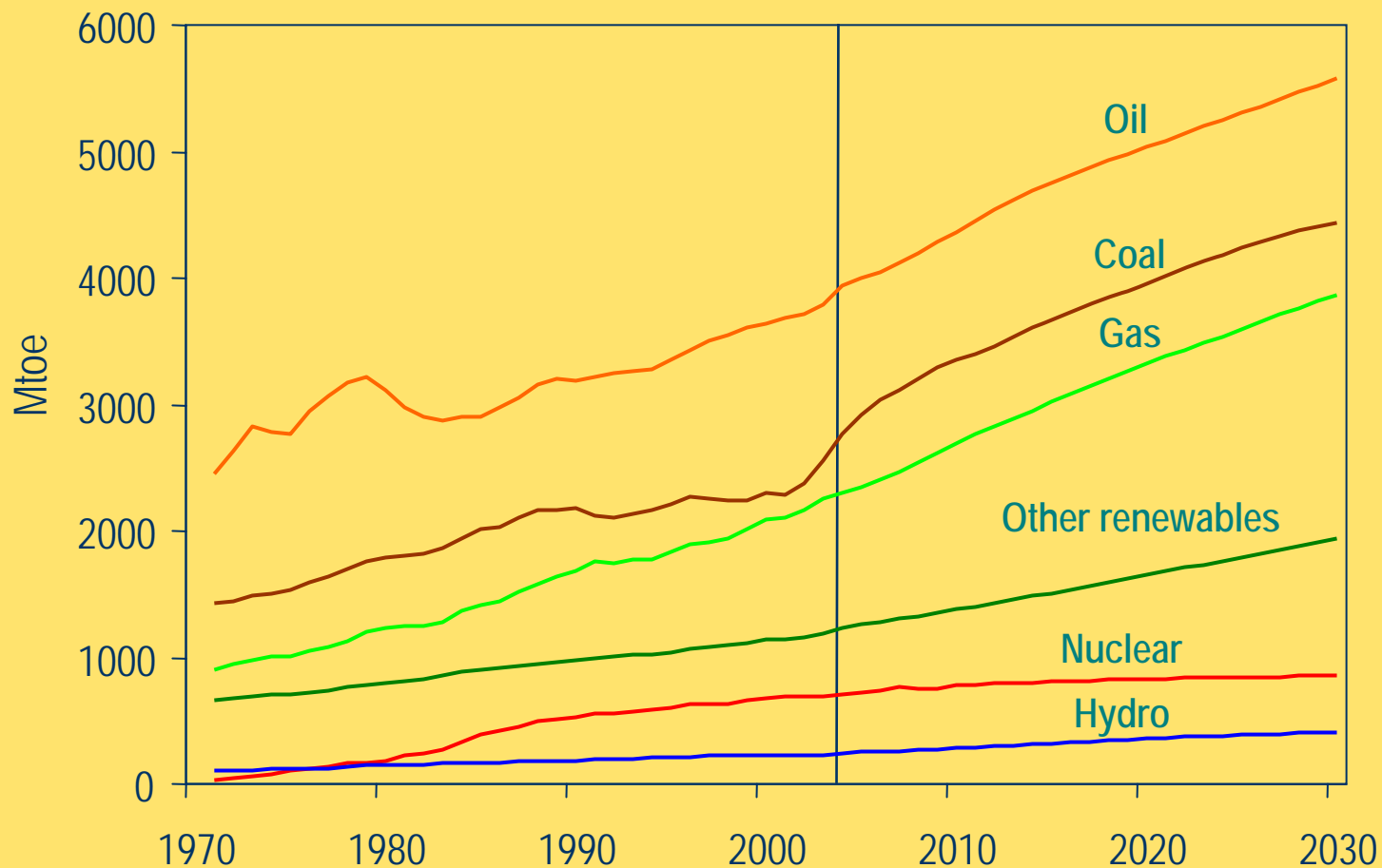
Focus on Asia

On behalf of the Economic Analysis Division
International Energy Agency

- The world is facing **twin energy threats**
 - ❑ *Inadequate and insecure supplies*
 - ❑ *Environmental damage, including climate change*
- There is an urgent need to curb the growth in fossil-fuel demand & related emissions
- *WEO-2006* is a direct response to G8 request for advice on alternative energy scenarios
- It confirms that the global energy system is on an unsustainable path...
- ...but measures now being considered would curb the growth of fossil-fuel demand & emissions

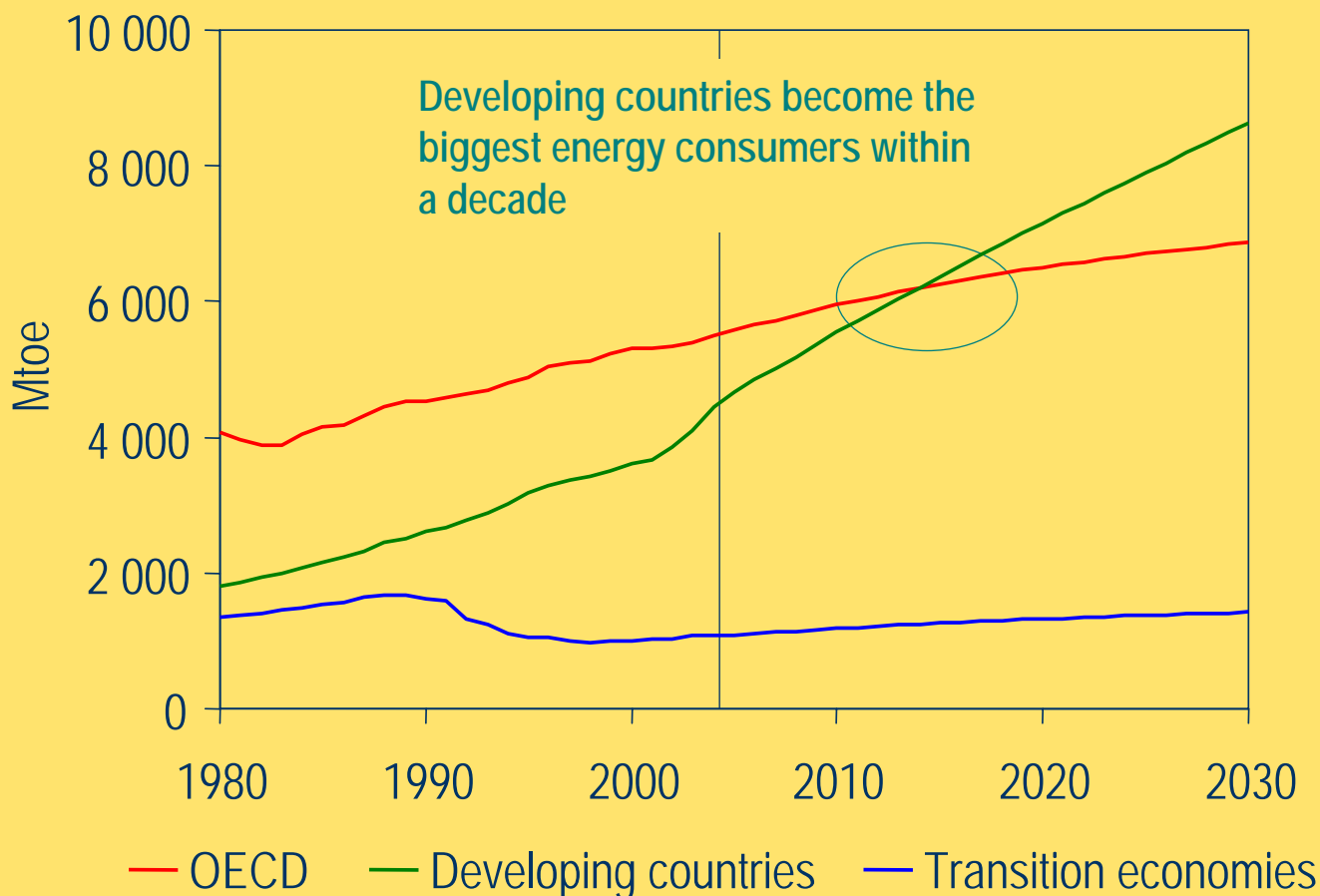
- Two scenarios depict markedly different energy futures to 2030
 - *Reference Scenario: No new government policies are adopted*
 - *Alternative Policy Scenario: Energy-security & climate-change policies now under consideration are adopted*

Reference Scenario: World Primary Energy Demand



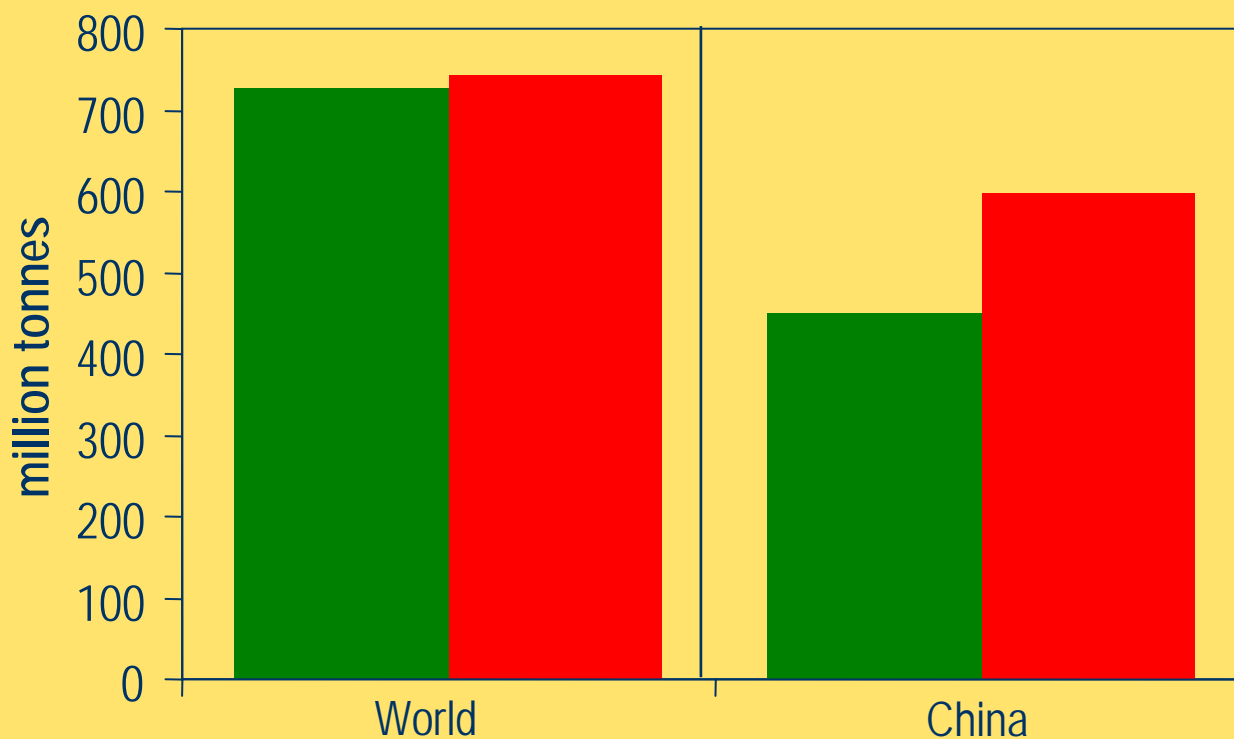
Global demand for each primary energy source grows inexorably driven by population & economic growth

Reference Scenario: Primary Energy Demand by Region



World oil demand grows by just over half between 2004 and 2030, with 70% of the increase coming from developing countries

Increase in Coal Demand in World & China

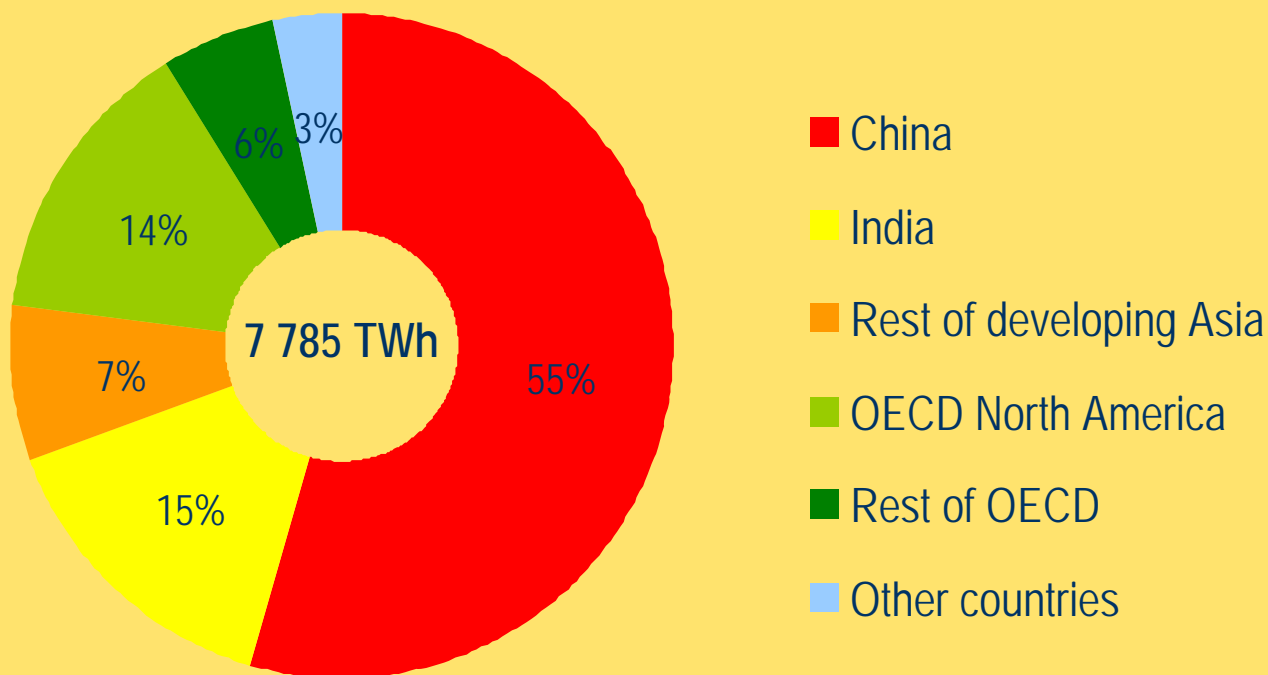


■ Increase in 10 years between 1993 and 2003

■ Increase in 2 years between 2003 and 2005

Global coal demand in past two years has grown much faster than previously – mainly driven by China

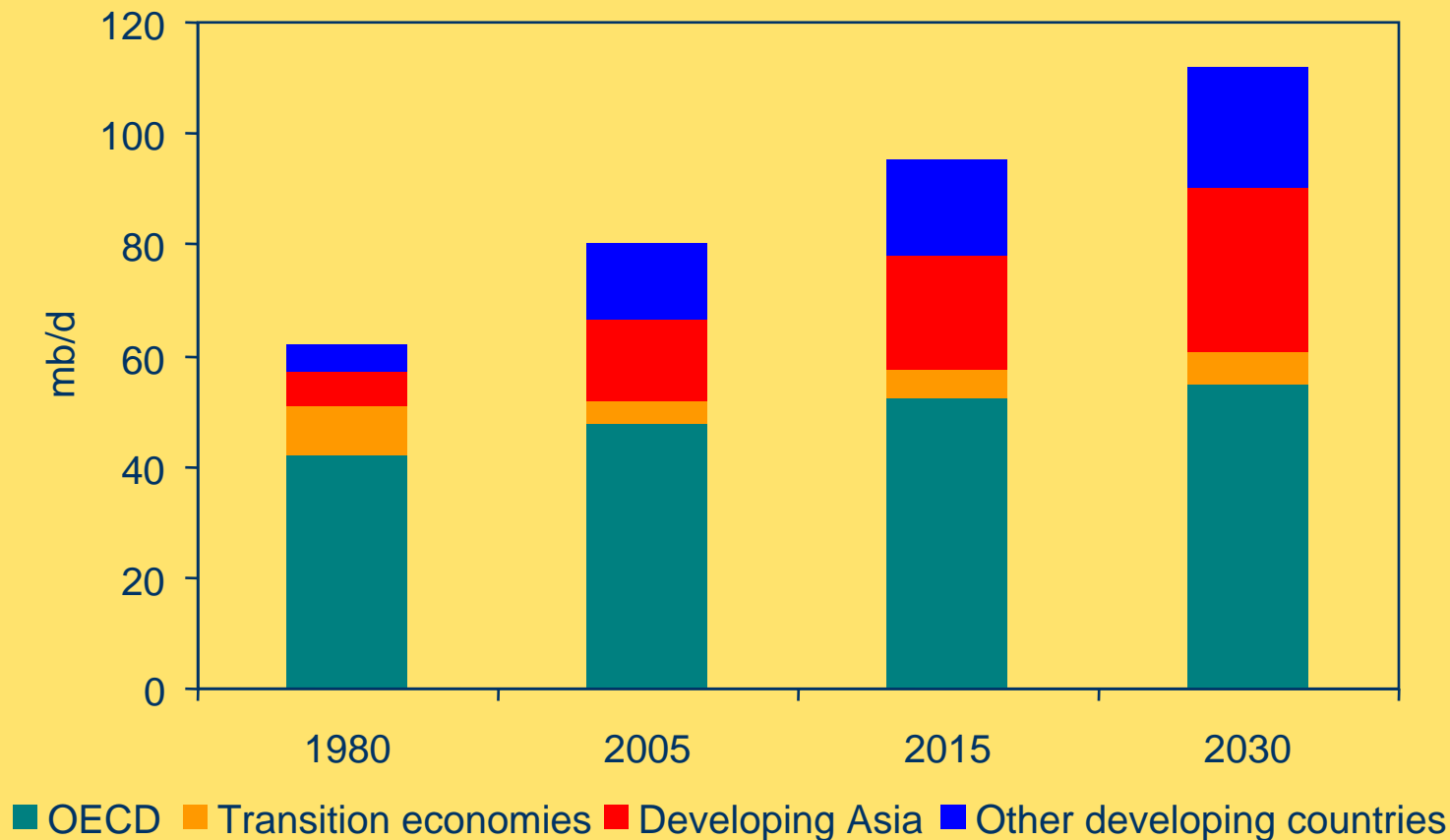
Incremental Coal-Fired Electricity Generation by Region, 2004-2030



Over three-quarters of the increase in coal-fired generation is in developing Asia, where coal reserves are ample

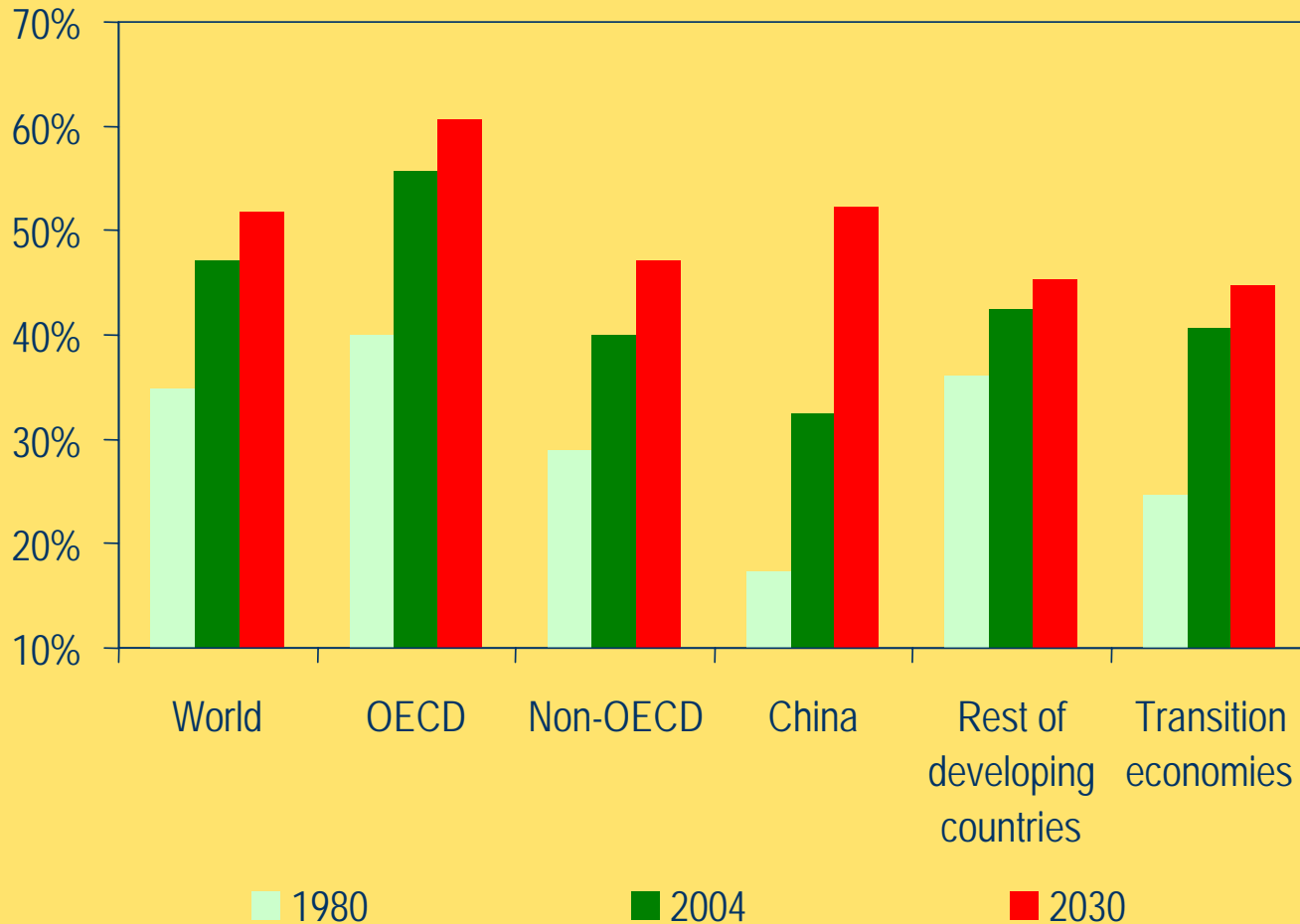
- The threat to the world's energy security is real & growing
 - ❑ *The share of transport in total oil use rises in all regions*
 - ❑ *Reliance on a small number of oil producers – notably in OPEC Middle East increases sharply*
 - ❑ *OECD & developing Asian oil & gas imports set to grow further*
- Oil prices still matter to the world economy
- Will the investment come?

Reference Scenario: Primary Oil Demand



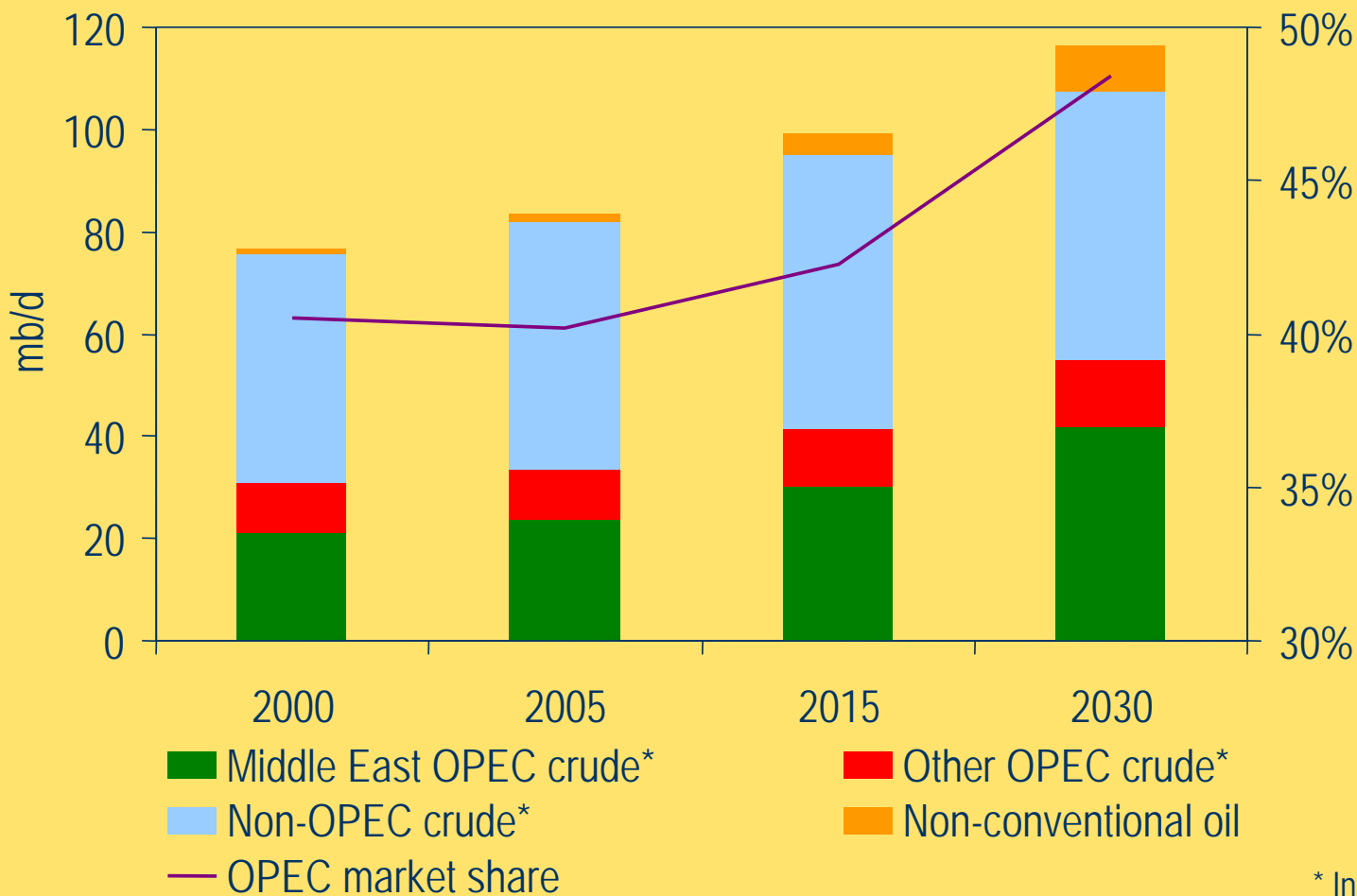
Most of the increase in oil demand comes from developing countries, where economic growth – the main driver of oil demand – is most rapid

Reference Scenario: Share of Transport in Total Oil use



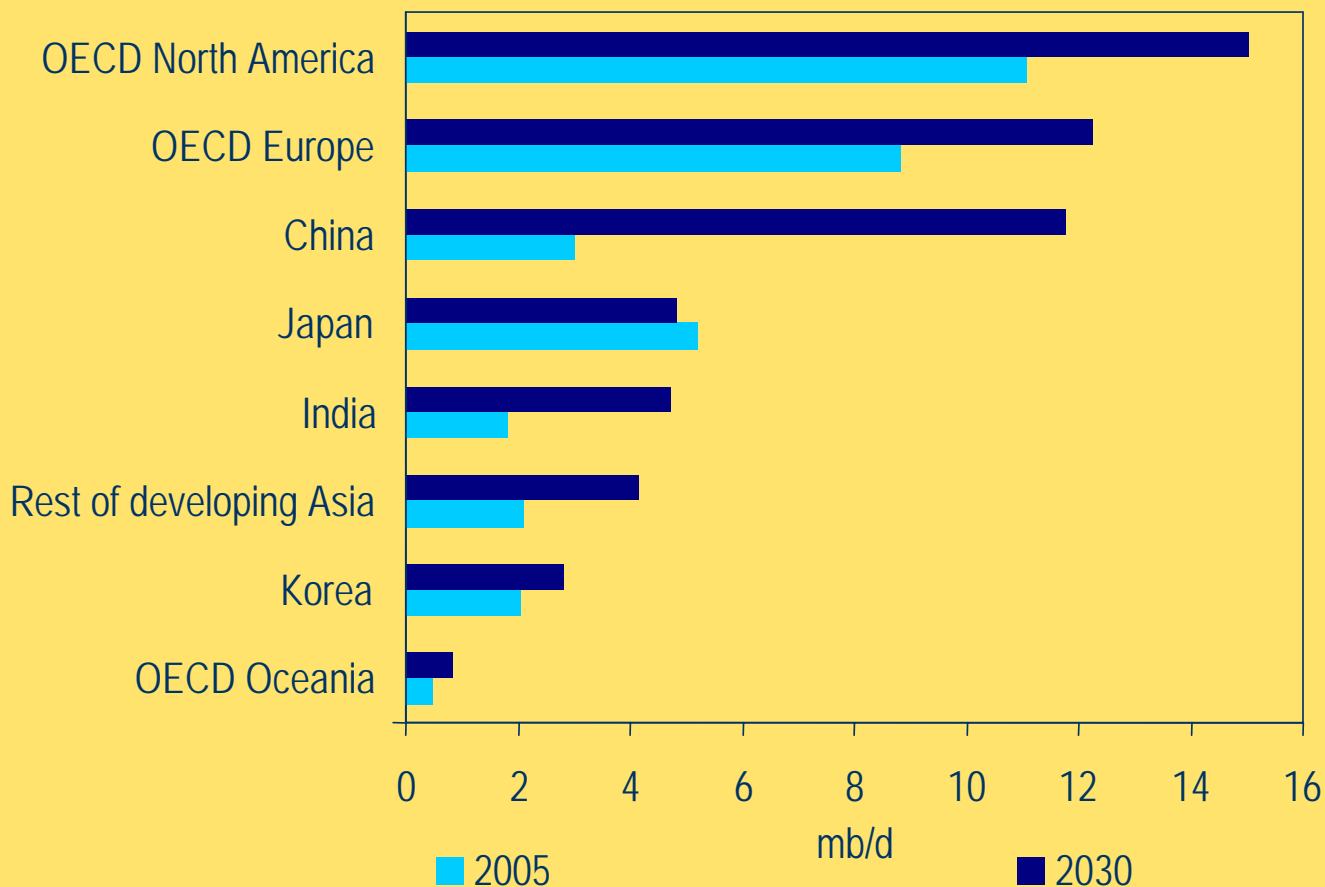
The rising share of transport – which is relatively price inelastic – makes oil demand less responsive to movements in international oil prices

Reference Scenario: World Primary Oil Supply



OPEC takes the lion's share of oil market growth as conventional non-OPEC production peaks, but non-conventional oil plays a growing role

Reference Scenario: Net Oil Imports

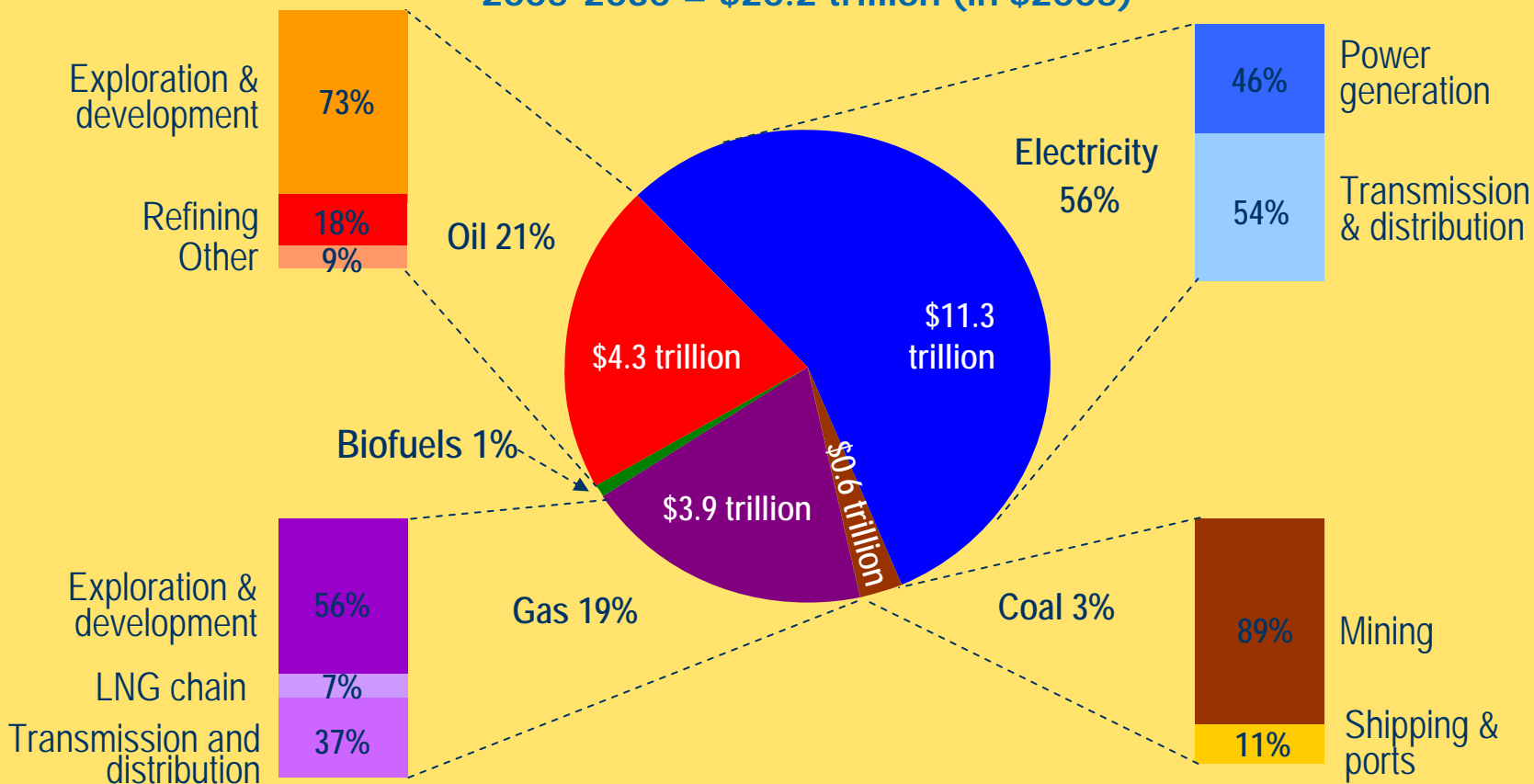


China sees the biggest jump in oil imports in absolute terms, but North America remains the largest importer

Reference Scenario: Will the Investment Come?



**Cumulative Investment in Energy-Supply Infrastructure,
2005-2030 = \$20.2 trillion (in \$2005)**

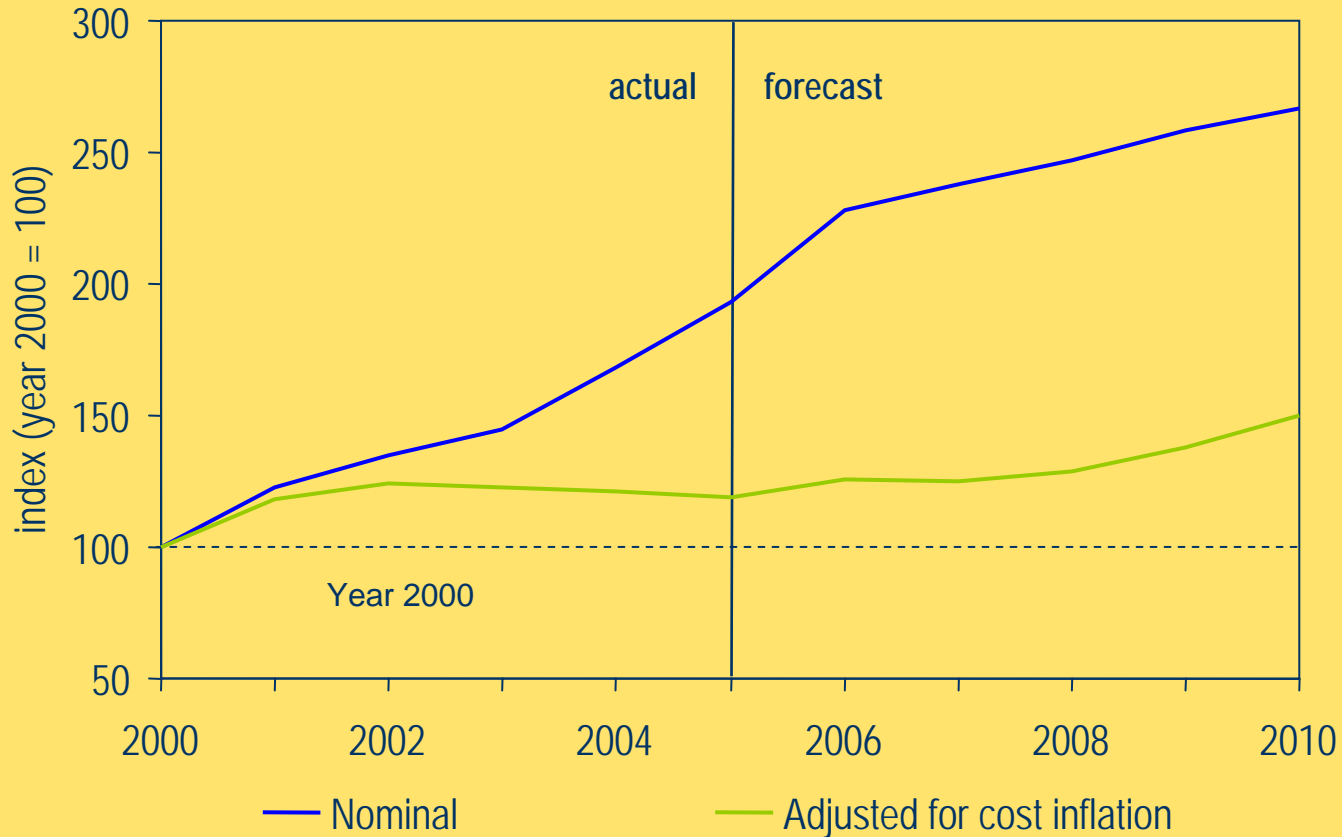


Just over half of all investment needs to 2030 are in developing countries, 18% in China alone

Impact of Cost Inflation on Oil & Gas Investment

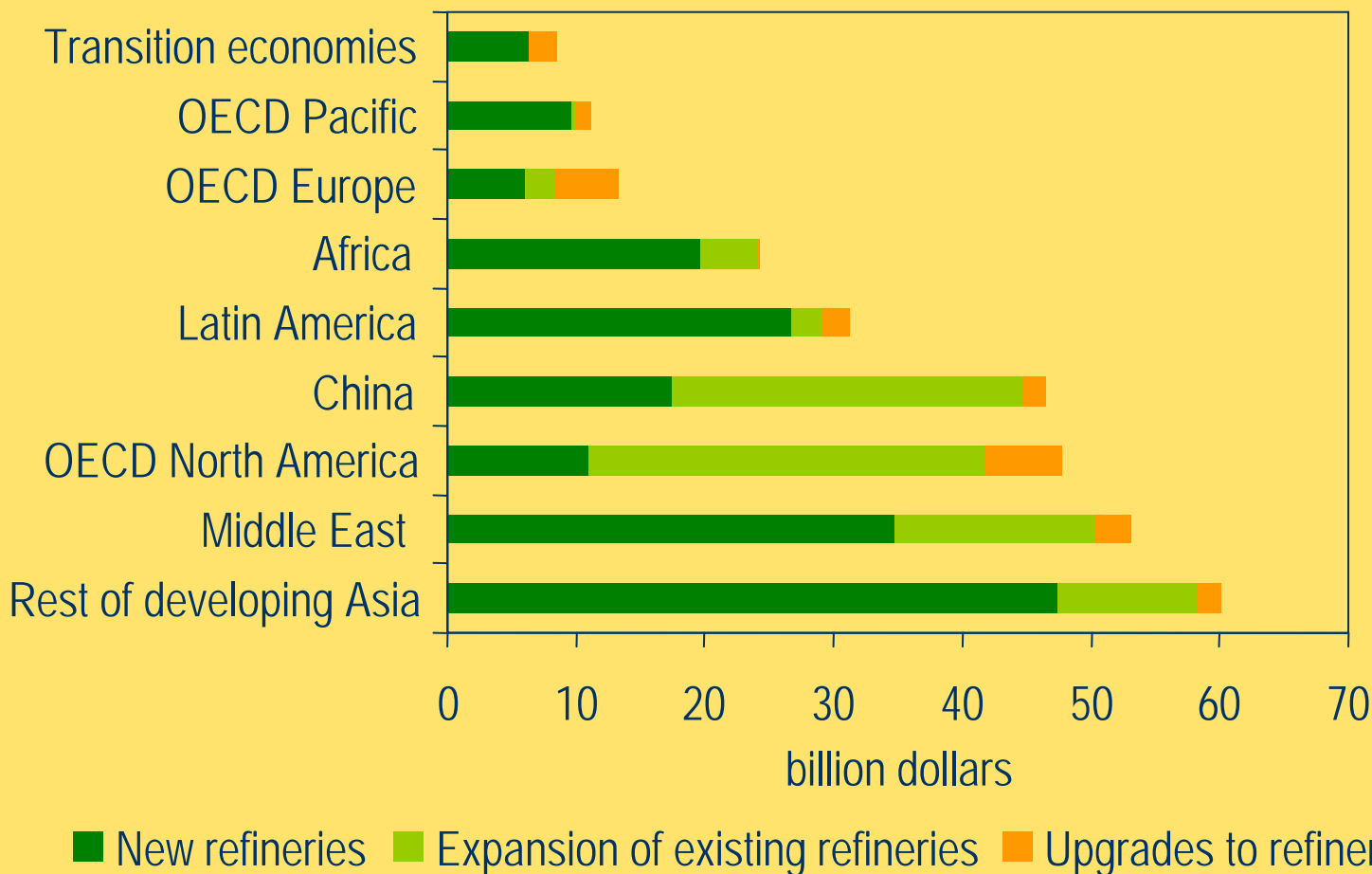


Global Upstream Oil & Gas Investment



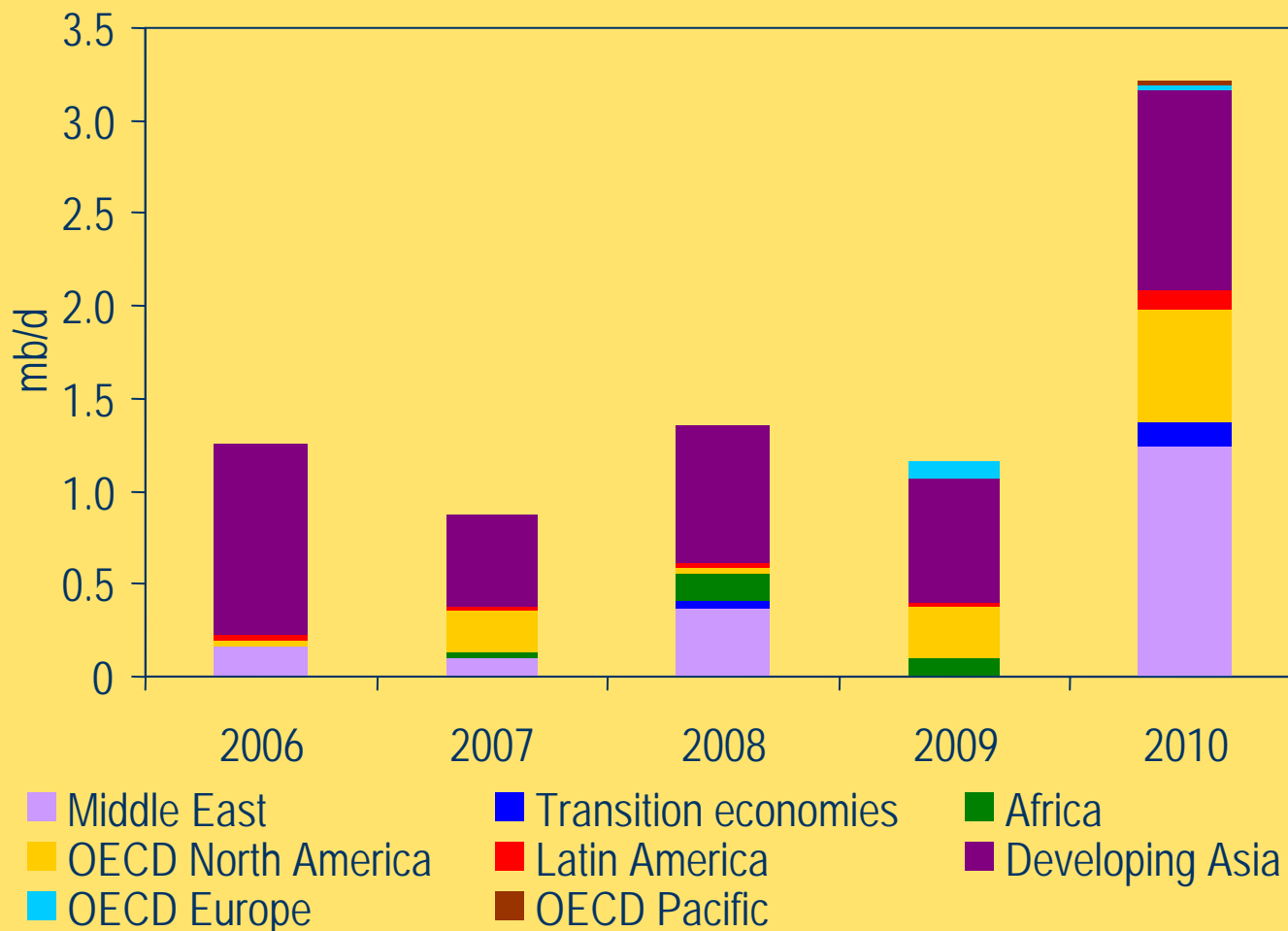
Investment has surged in recent years with higher prices but most of the increase is due to cost inflation, rather than increased real activity

World Oil Refinery Investment, 2006-2010



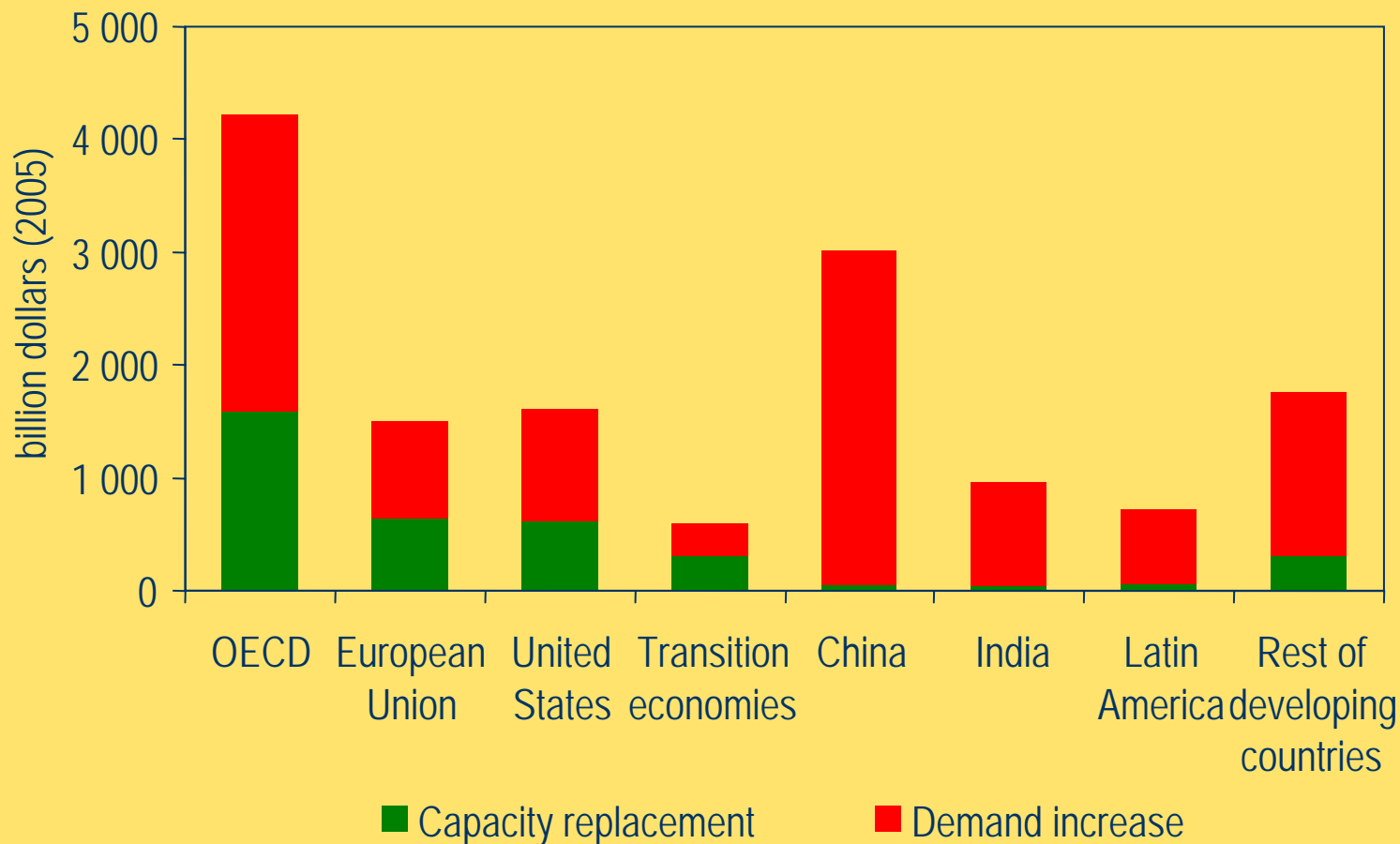
Most new distillation capacity will be built in developing countries – Developing Asia and Middle East will account for lion's share

World Oil Refinery Capacity Additions, 2006-2010



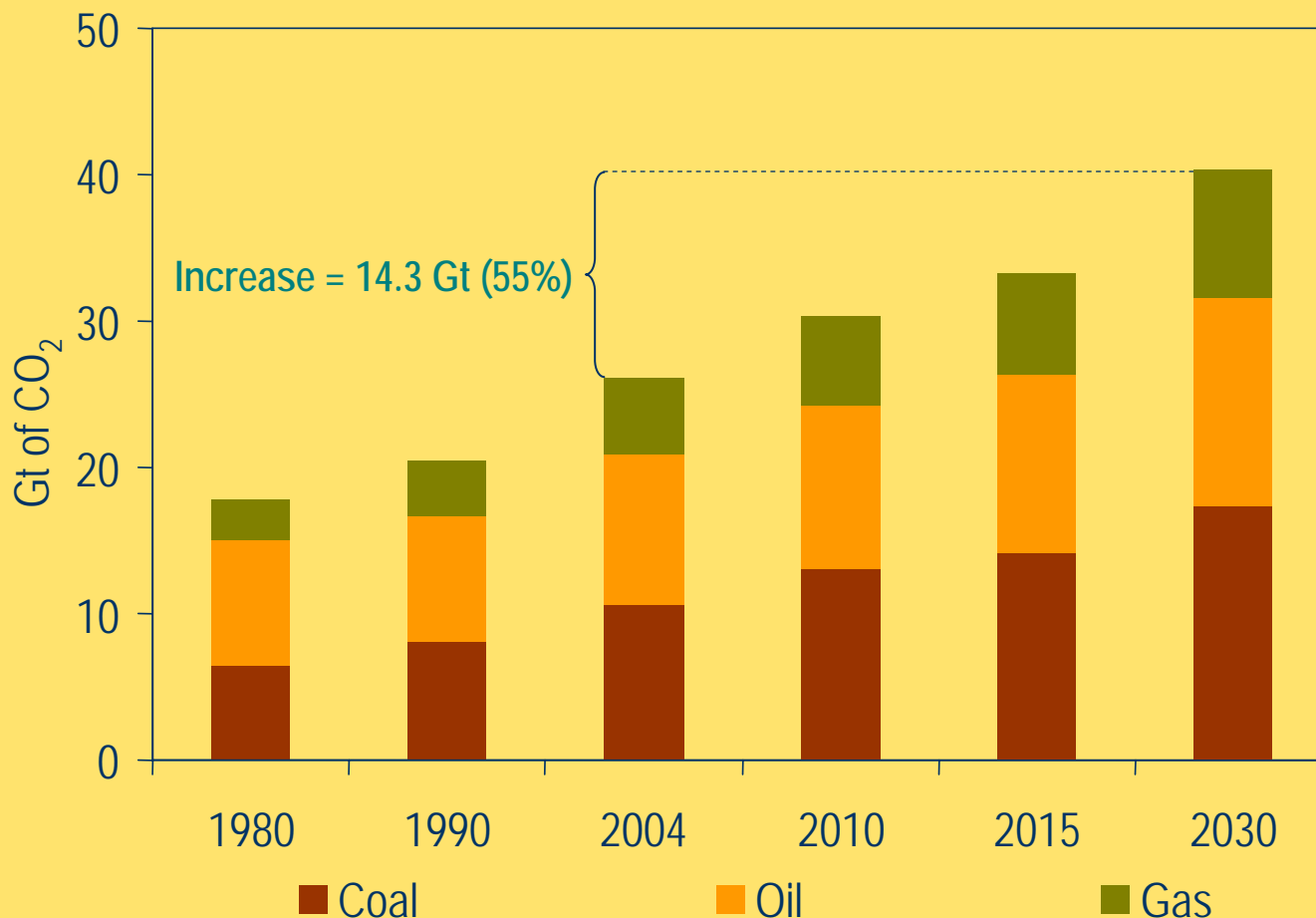
The biggest increases in capacity are planned for developing Asia – mainly China and India – and the Middle East

Cumulative Power-Sector Investment, 2005-2030



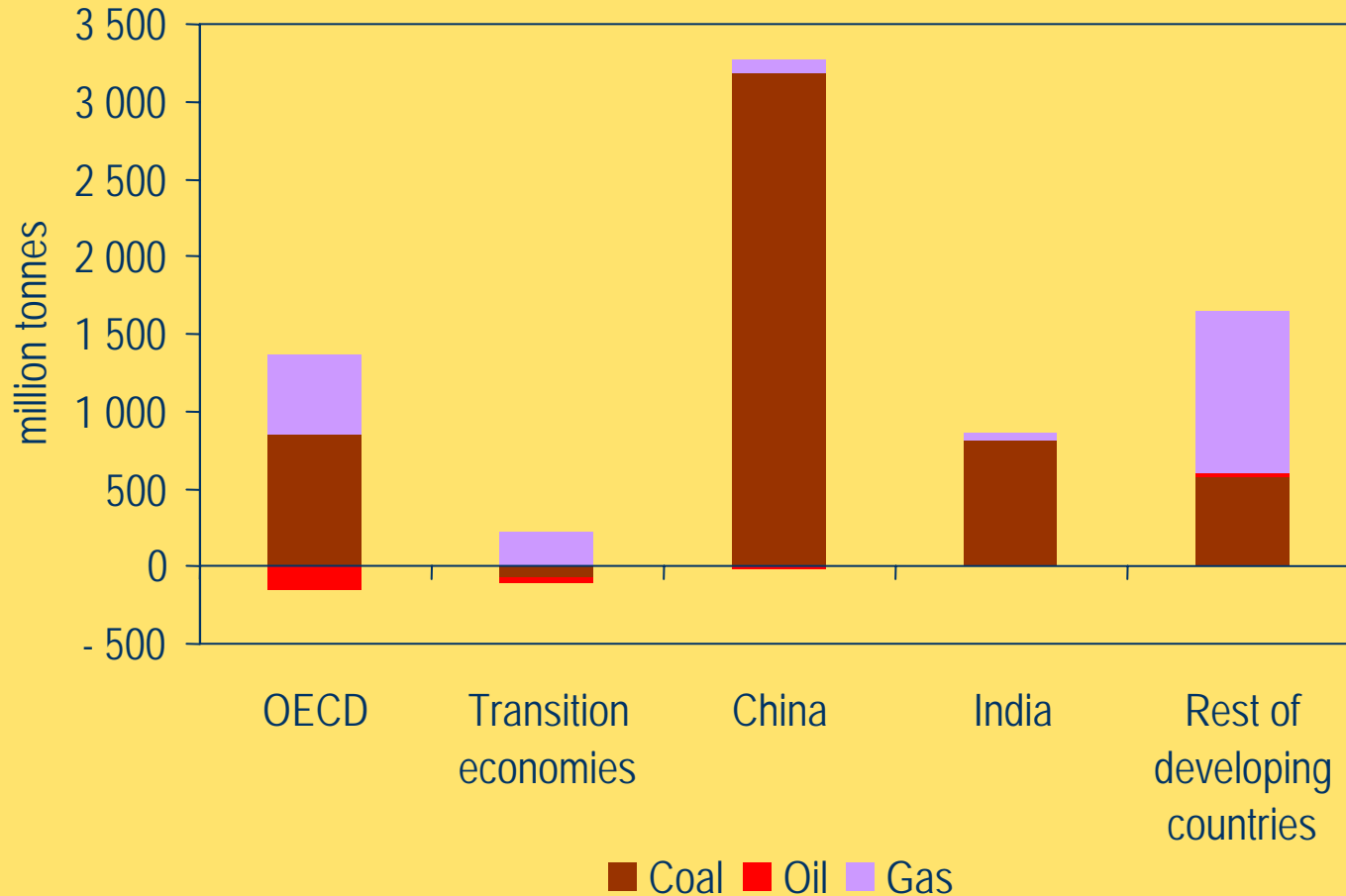
The largest investments are needed in developing Asia – especially China – mostly to meet surging demand

Reference Scenario: Implications for CO₂ Emissions



Half of the projected increase in emissions comes from new power stations, mainly using coal & mainly located in China & India

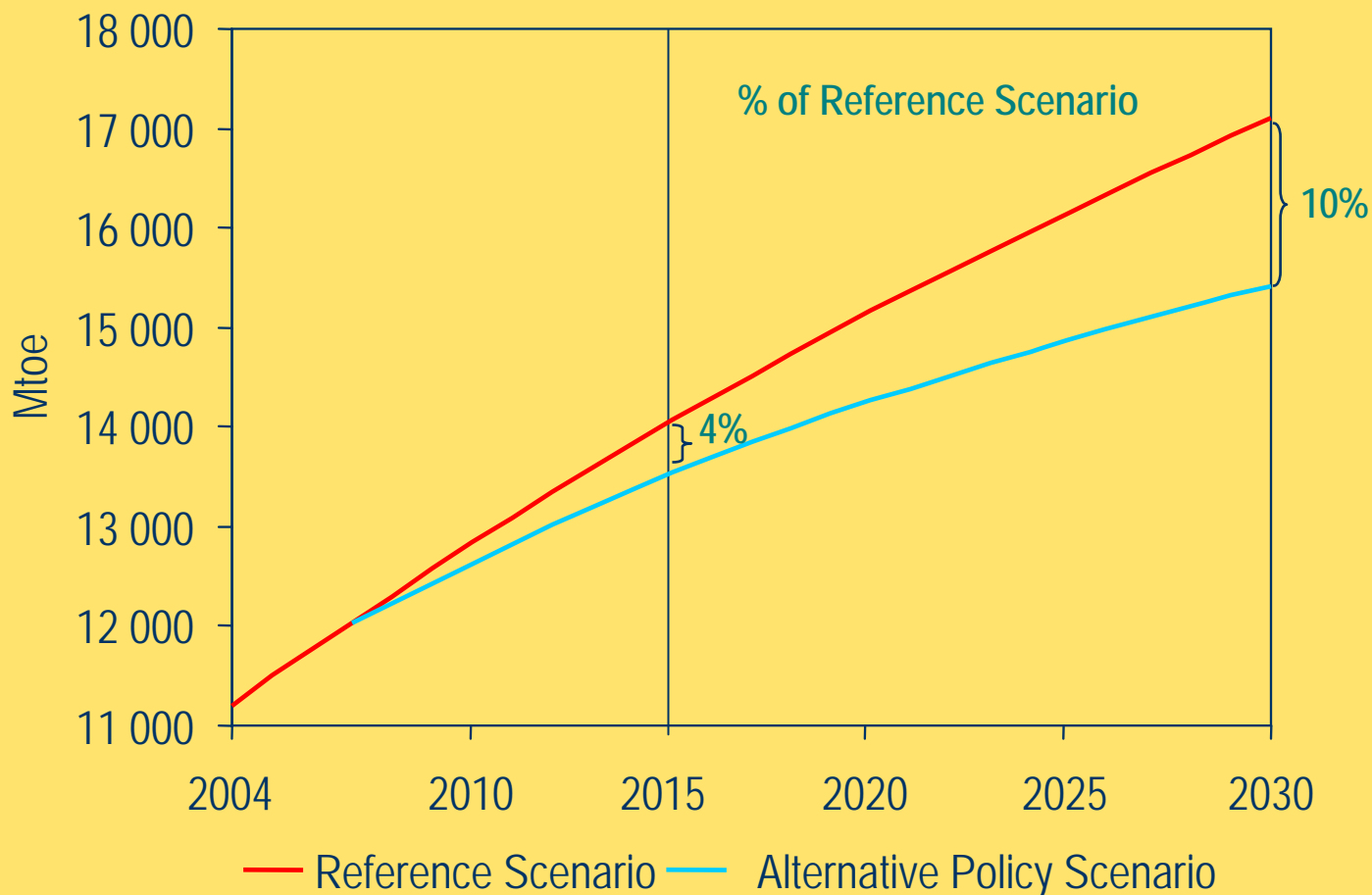
Increase in Power Sector CO₂ Emissions by Fuel, 2004-2030



China & India account for 58% of the increase in CO₂ emissions in the power sector

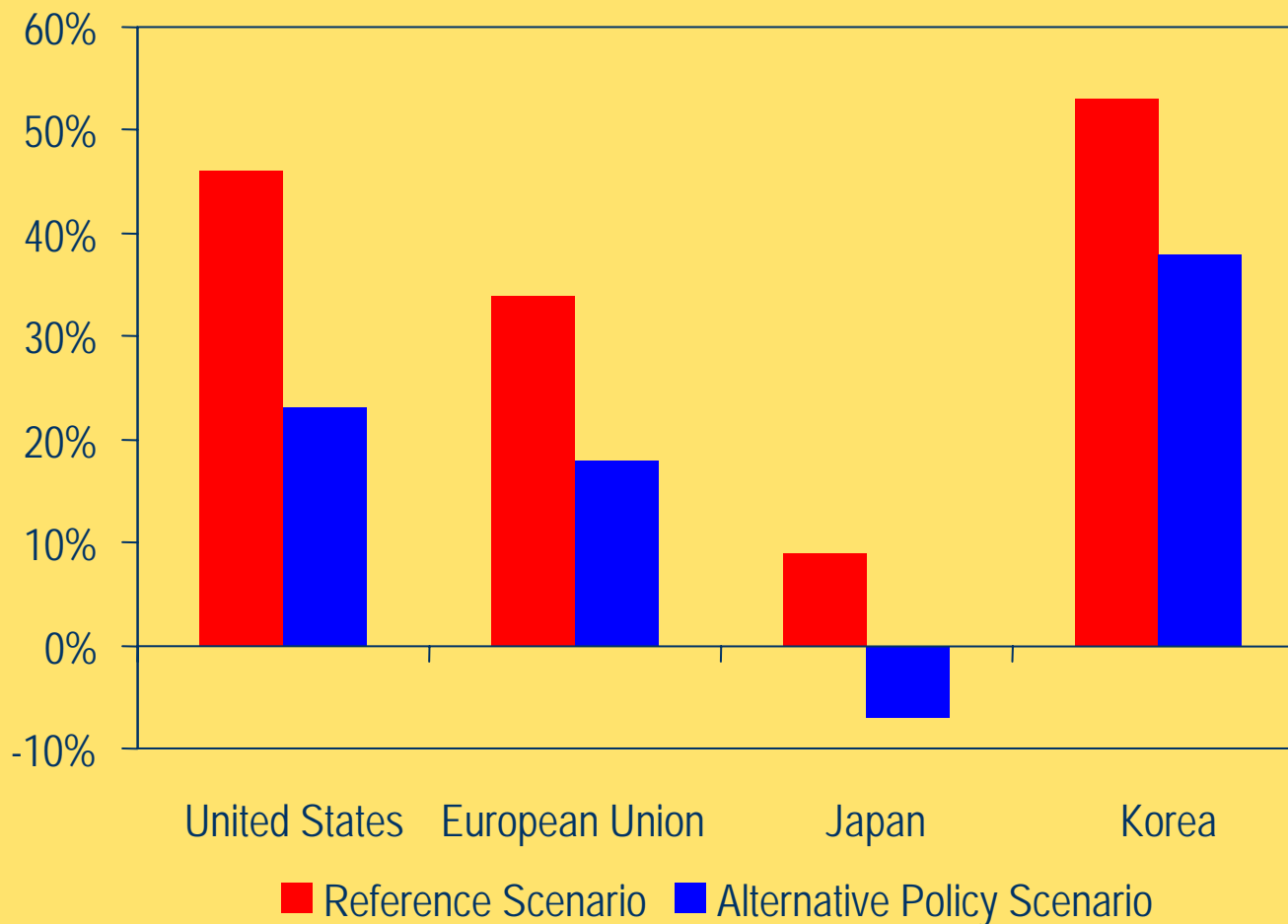
- Reference Scenario trends are not set in stone
- The **Alternative Policy Scenario** analyses impact of government policies under consideration
- Responds to call to IEA from G8 & IEA ministers
 - ❑ *To “advise on alternative energy scenarios and strategies aimed at a clean, clever and competitive energy future”*
- 1 400+ different policies worldwide analysed to
 - ❑ *Improve efficiency in energy production & use*
 - ❑ *Increase reliance on non-fossil fuels*
 - ❑ *Bolster output of oil & gas in net importing countries*

Alternative Policy Scenario: World Primary Energy Demand



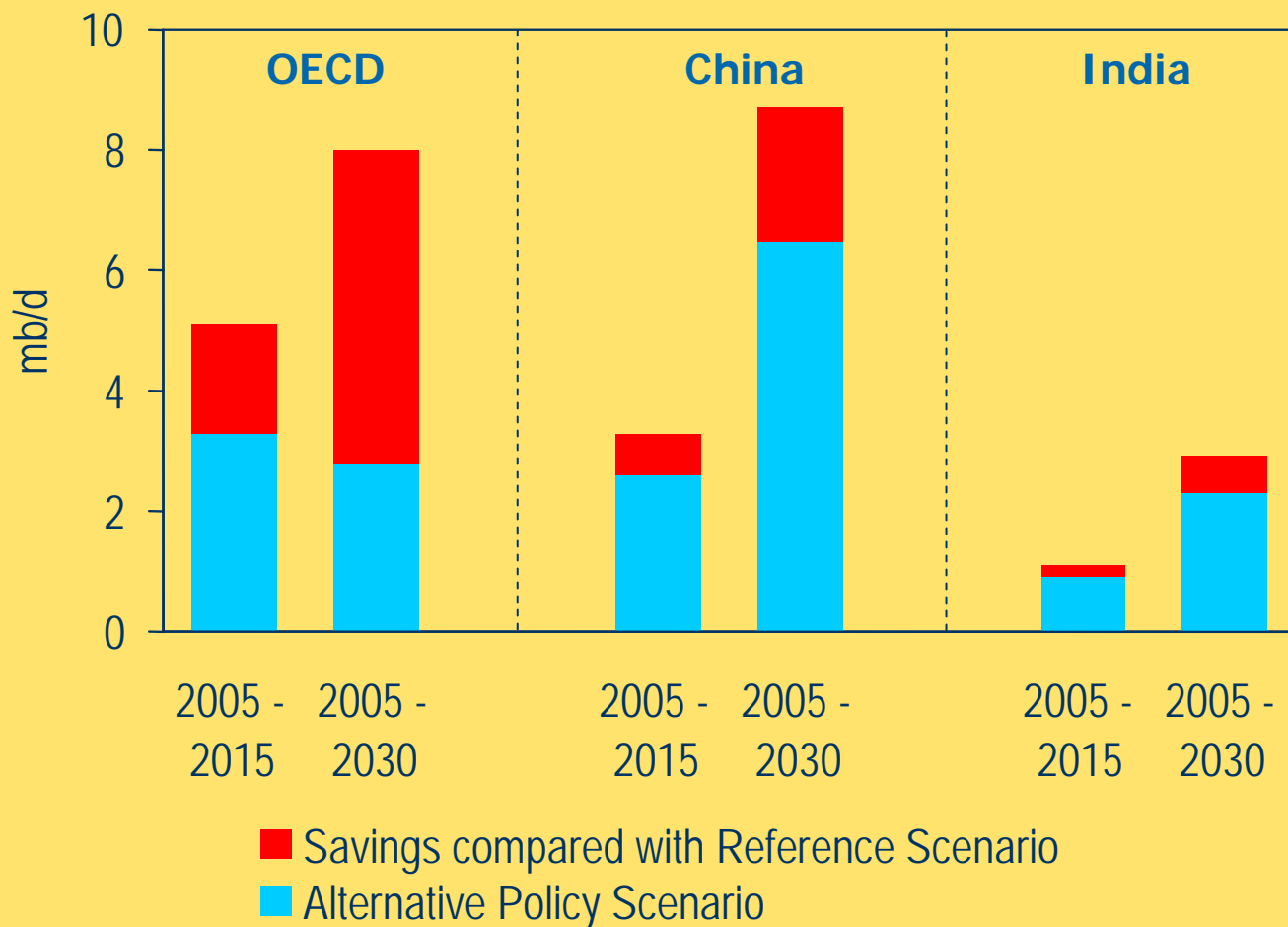
The policies analysed would cut energy demand in 2030 by 10%, or 1 690 Mtoe – roughly equal to China's entire energy consumption today

Alternative Policy Scenario: Oil & Gas Import Dependence



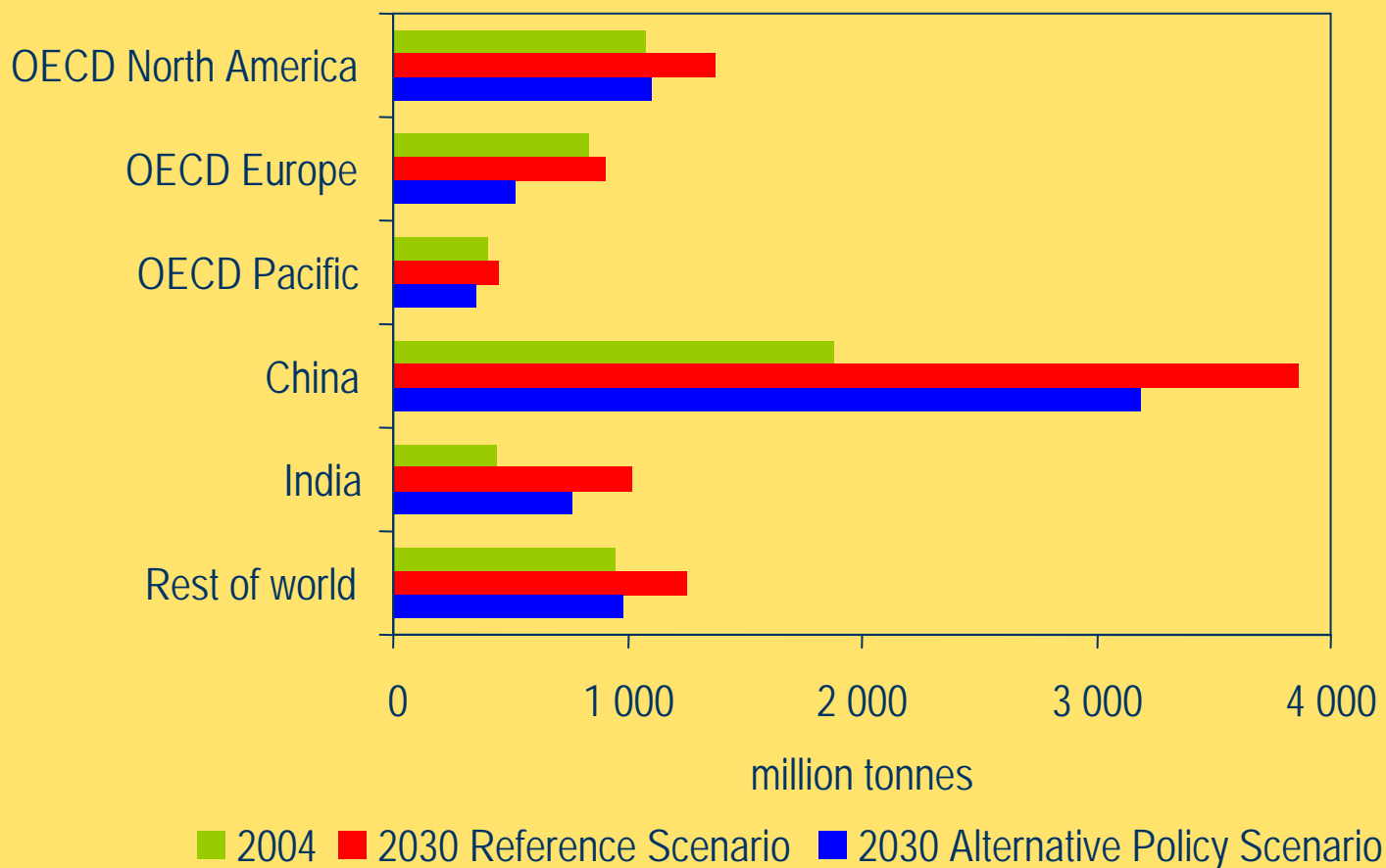
New policies mitigate the supply-security risk in consuming countries by reducing the growth of demand & imports

Alternative Policy Scenario: Incremental Net Oil Imports



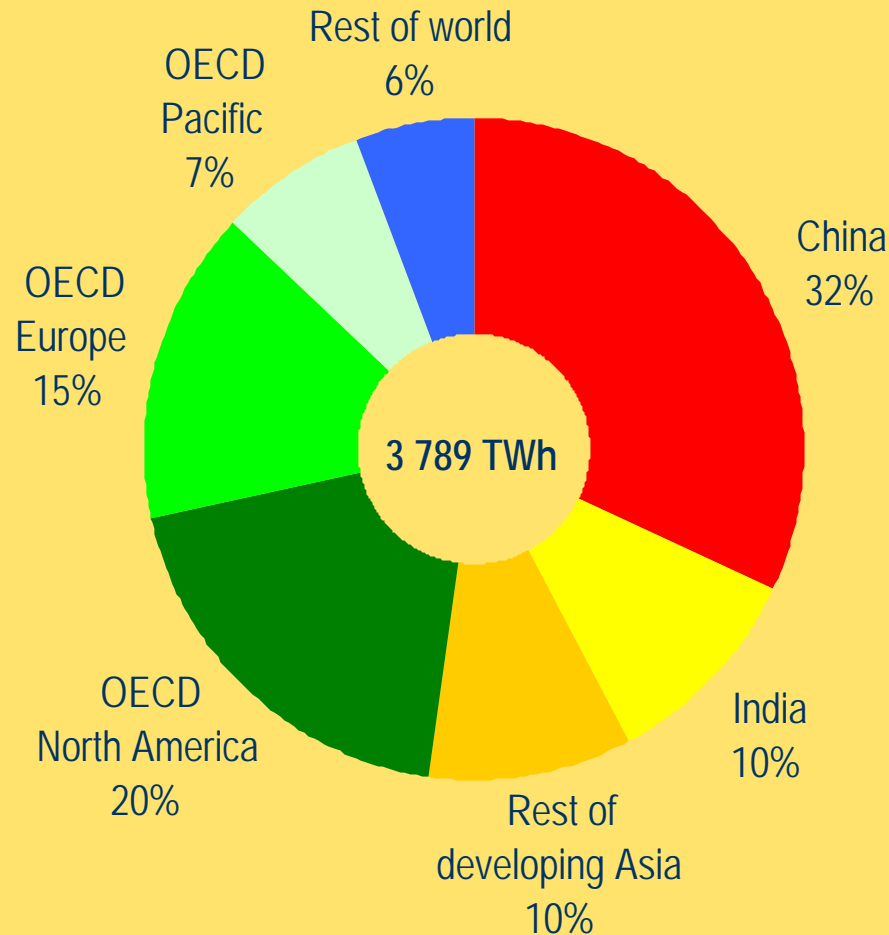
In contrast to the Reference Scenario, OECD oil imports peak & then decline before 2030

Alternative Policy Scenario: Savings in Primary Coal Demand



Coal demand in 2030 is reduced by around one-fifth, with the biggest savings in absolute terms occurring in China

Alternative Policy Scenario: Reduction in Coal-fired Generation vs. the Reference Scenario

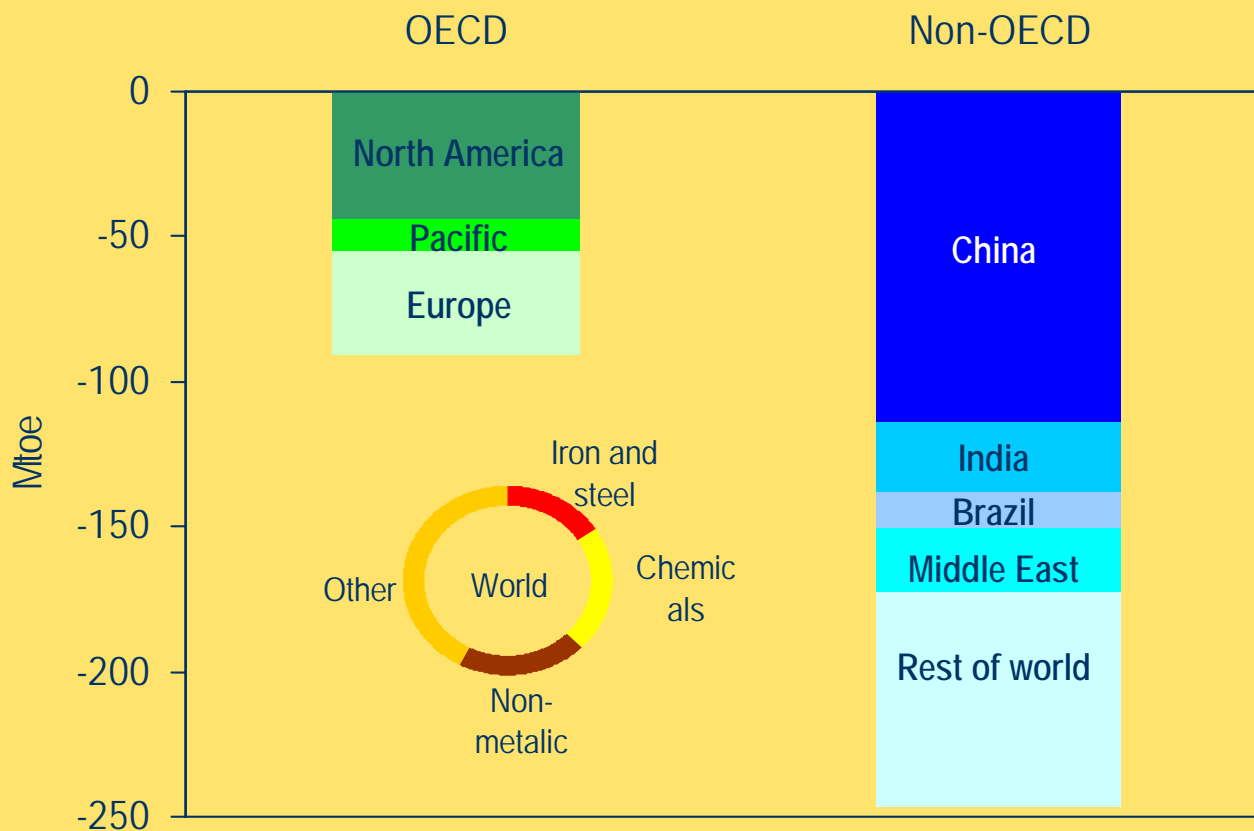


Coal-fired generation falls sharply, with a third of the savings coming from China

The Alternative Policy Scenario: Industry Sector

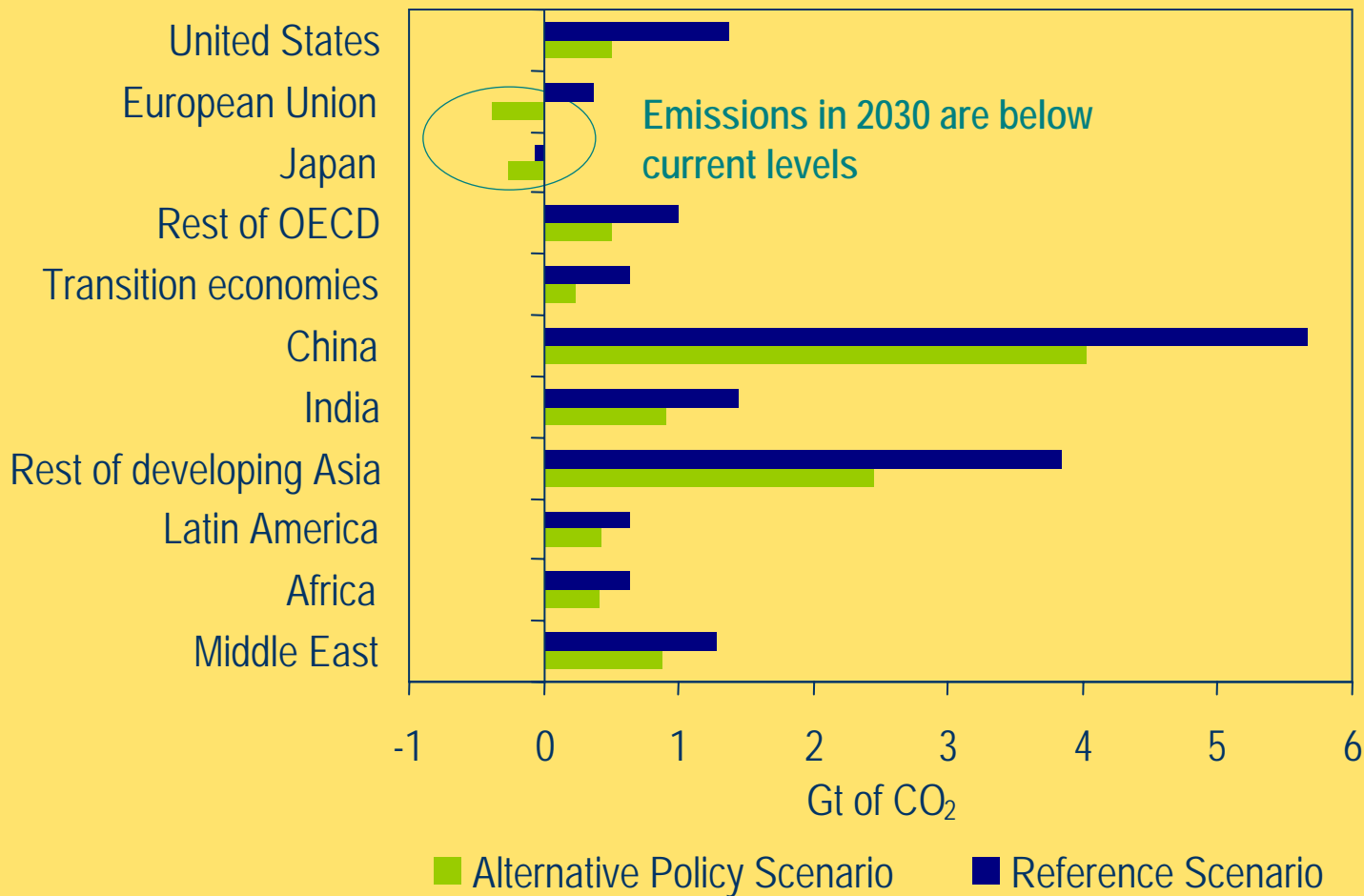


**Change in Industrial Energy Demand by Region and Sector
Compared with the Reference Scenario in 2030**



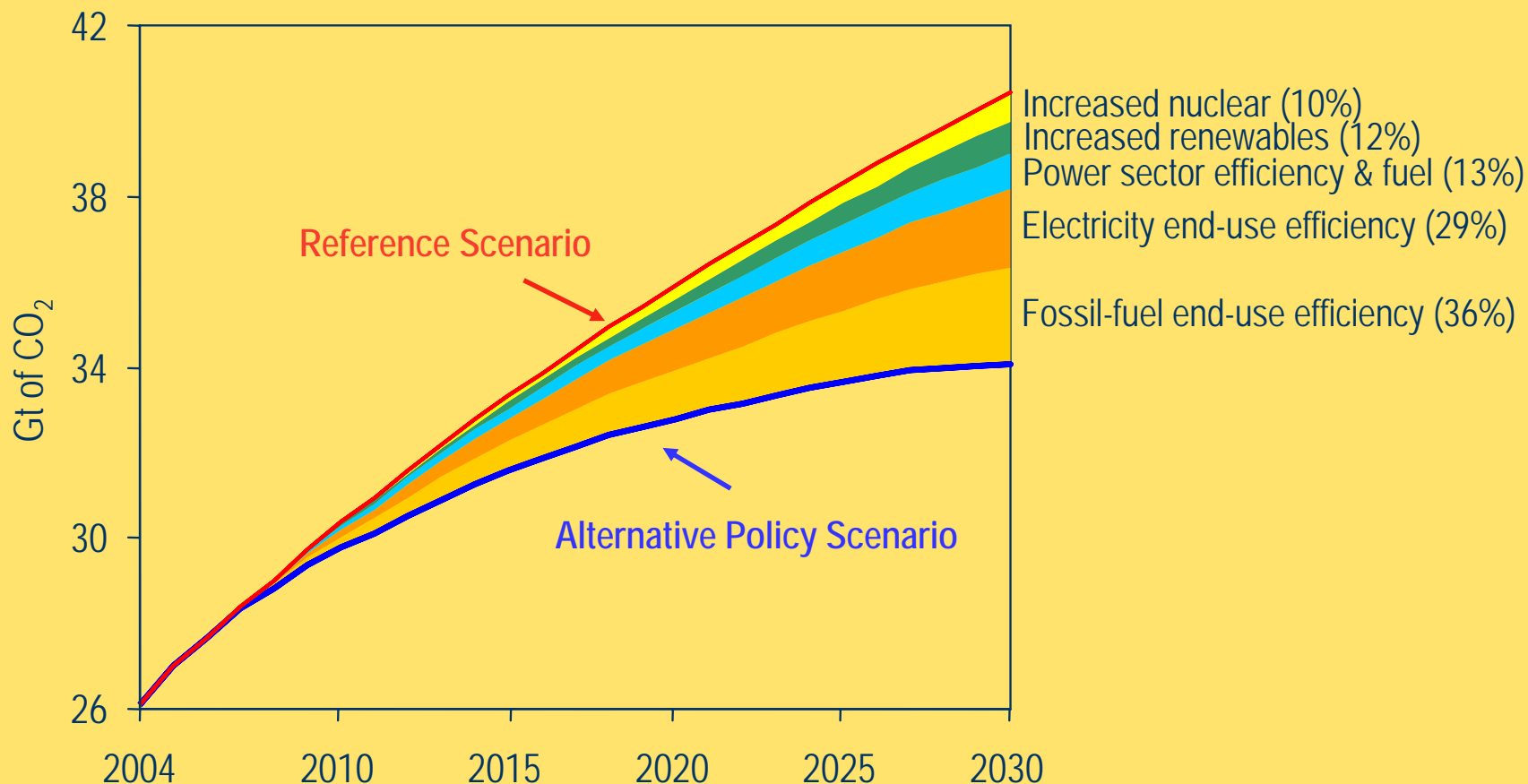
Savings in industry in non-OECD countries are over two-and-a-half times greater than in OECD countries

Alternative Policy Scenario: Change in Energy-Related CO₂ Emissions, 2004-2030



OECD emissions peak & then decline before 2030, falling below 2004 levels in Europe and Japan

Alternative Policy Scenario: Global Savings in Energy-Related CO₂ Emissions

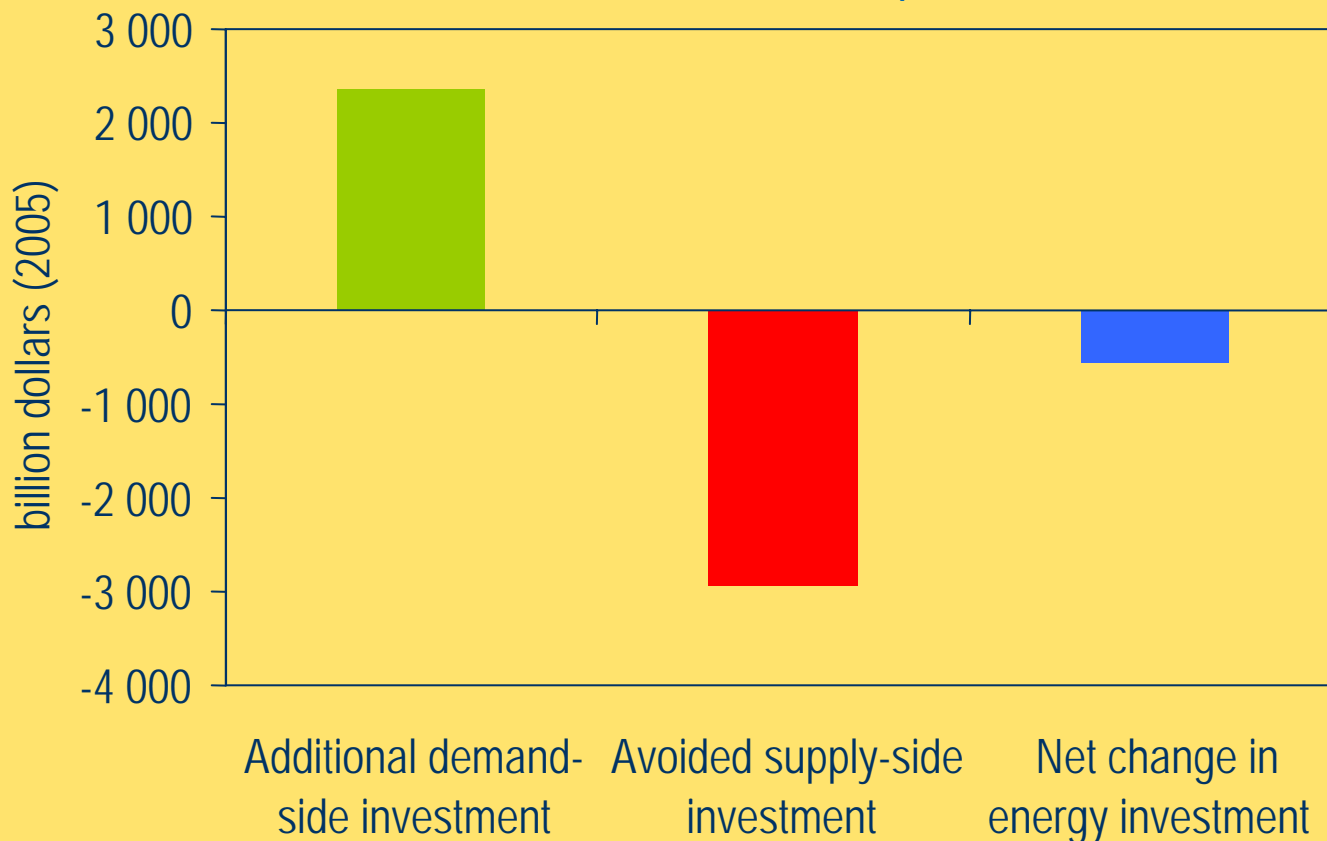


Improved end-use efficiency of electricity & fossil fuels is accounts for two-thirds of avoided emissions in 2030

Alternative Policy Scenario: Energy Investment

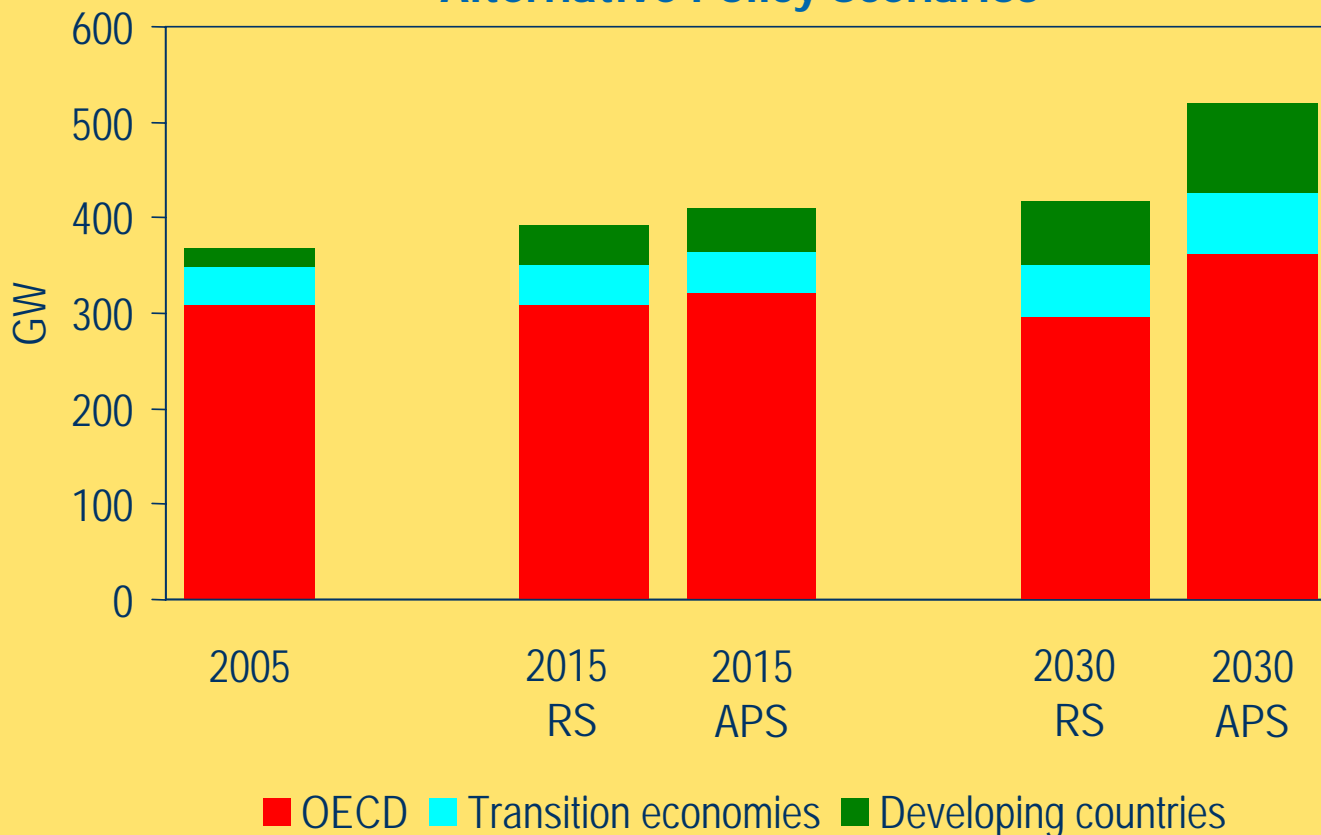


Change in Cumulative Energy-Related Investment
vs. Reference Scenario, 2005-2030



Avoided supply-side investment more than outweighs the additional investment by consumers in more expensive end-use capital stock

World Nuclear Capacity in the Reference and Alternative Policy Scenarios

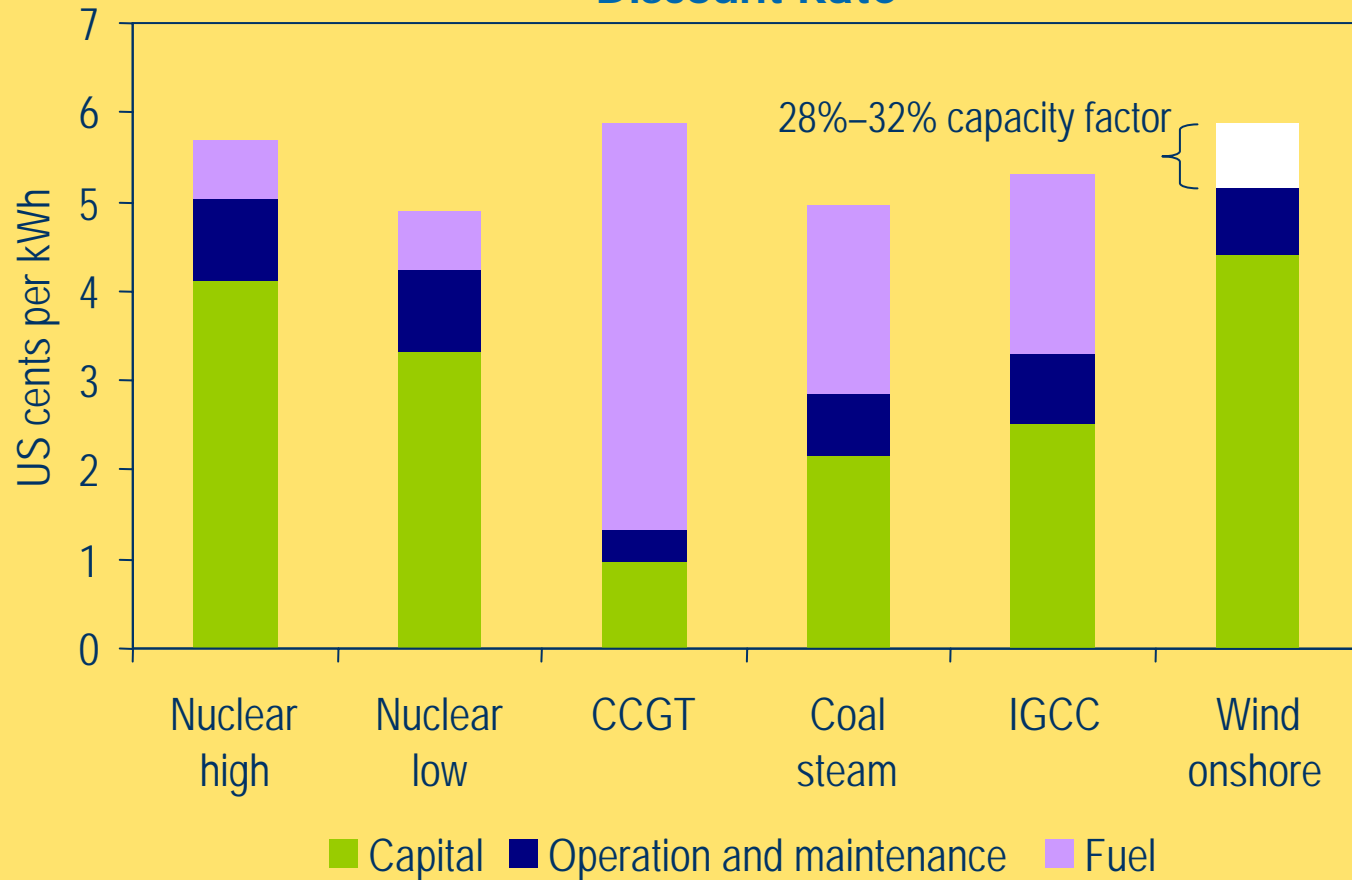


More favourable policies on nuclear could significantly accelerate the growth in global capacity – especially in OECD countries

Nuclear Power Generating Costs

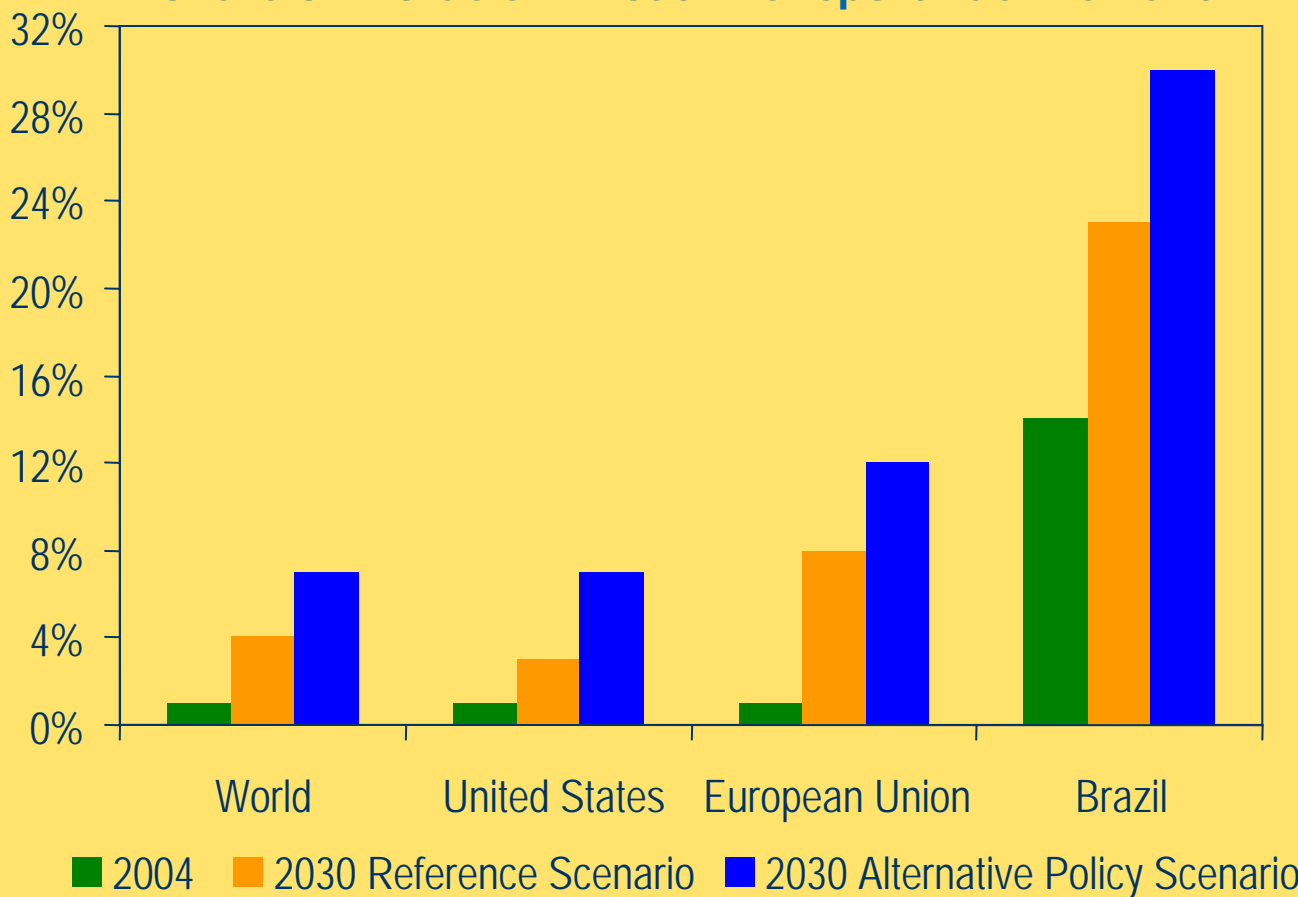


Comparative Generating Costs Based on Low Discount Rate



Nuclear could compete effectively against other fuel options, but public concerns over safety, waste disposal & risk of proliferation need to be met

Share of Biofuels in Road-Transport Fuel Demand

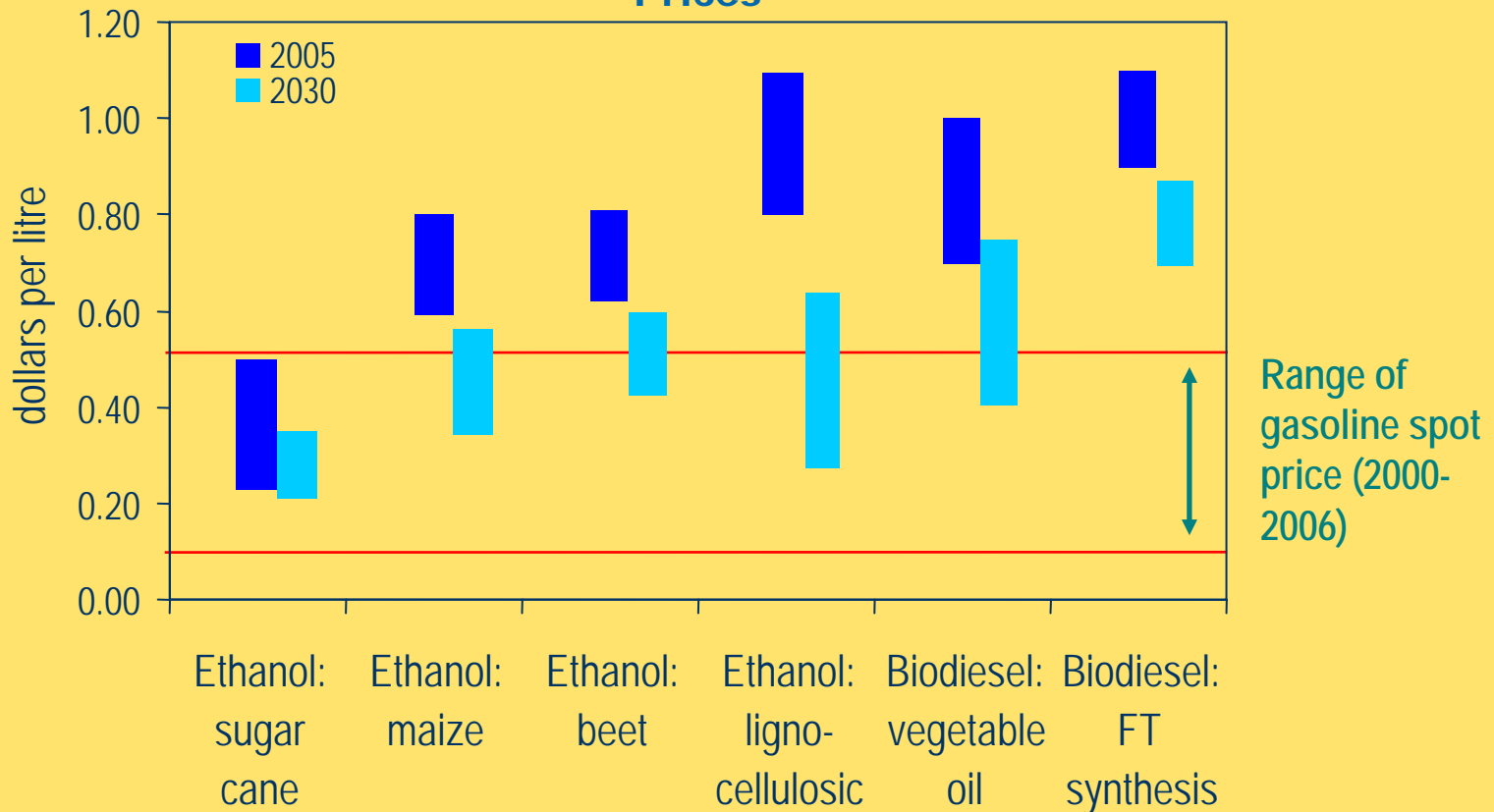


1st generation biofuels are set to play a much larger role in meeting world road-transport fuel demand

Biofuels Supply Costs



Indicative Biofuels Costs vs. Gasoline and Diesel Prices



Significant production cost reductions are expected – especially for 2nd-generation ligno-cellulosic ethanol

Making the Alternative Policy Scenario a Reality



- Formidable hurdles exist to the adoption & implementation of the Alternative Policy Scenario
- It will require considerable political will to push through those policies
- Private-sector support & international cooperation will be essential
- Action is needed urgently
 - *Delaying implementation by a decade would reduce cut in cumulative emissions to 2030 from 8% to 2%*
 - *Delays in stepping up R&D – particularly carbon capture & storage – would reduce cut in emissions after 2030*

Going Beyond the Alternative Policy Scenario



- Even in the Alternative Policy Scenario, energy demand & emissions keep rising to 2030
- Stabilising & then reducing both would call for much stronger policies
- Reducing emissions in 2030 to 2004 levels (-8Gt) is possible with current technologies (including CCS)..
- ...but, while technically feasible, this would be unprecedented in scale & speed
- In practice, technological breakthroughs are also needed to achieve a truly sustainable global energy system

- The need to diversify energy sources & mitigate emissions is more urgent than ever
- Global energy system is on an unsustainable path
- Strong new policies could sharply reduce the rate of increase in demand & emissions
- Economic cost of these policies would be more than outweighed by the economic benefits alone
- In the longer term, technology *development* will be critical to a sustainable energy system
- Governments also need to tackle market barriers to ensure investment is forthcoming
- Asia will need to play a central role in getting to a truly sustainable energy future



Thank you

www.worldenergyoutlook.org