



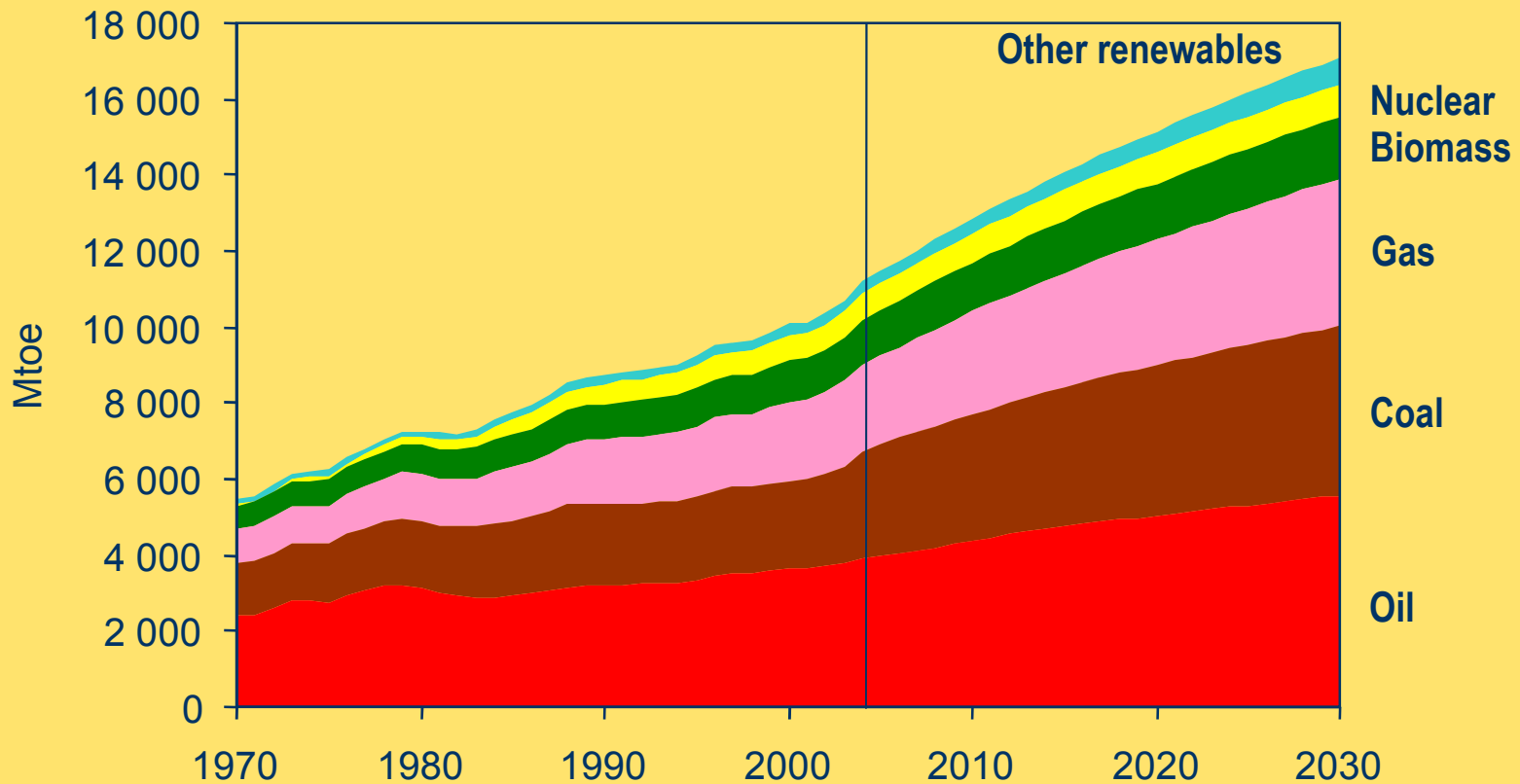
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World Energy Outlook 2006

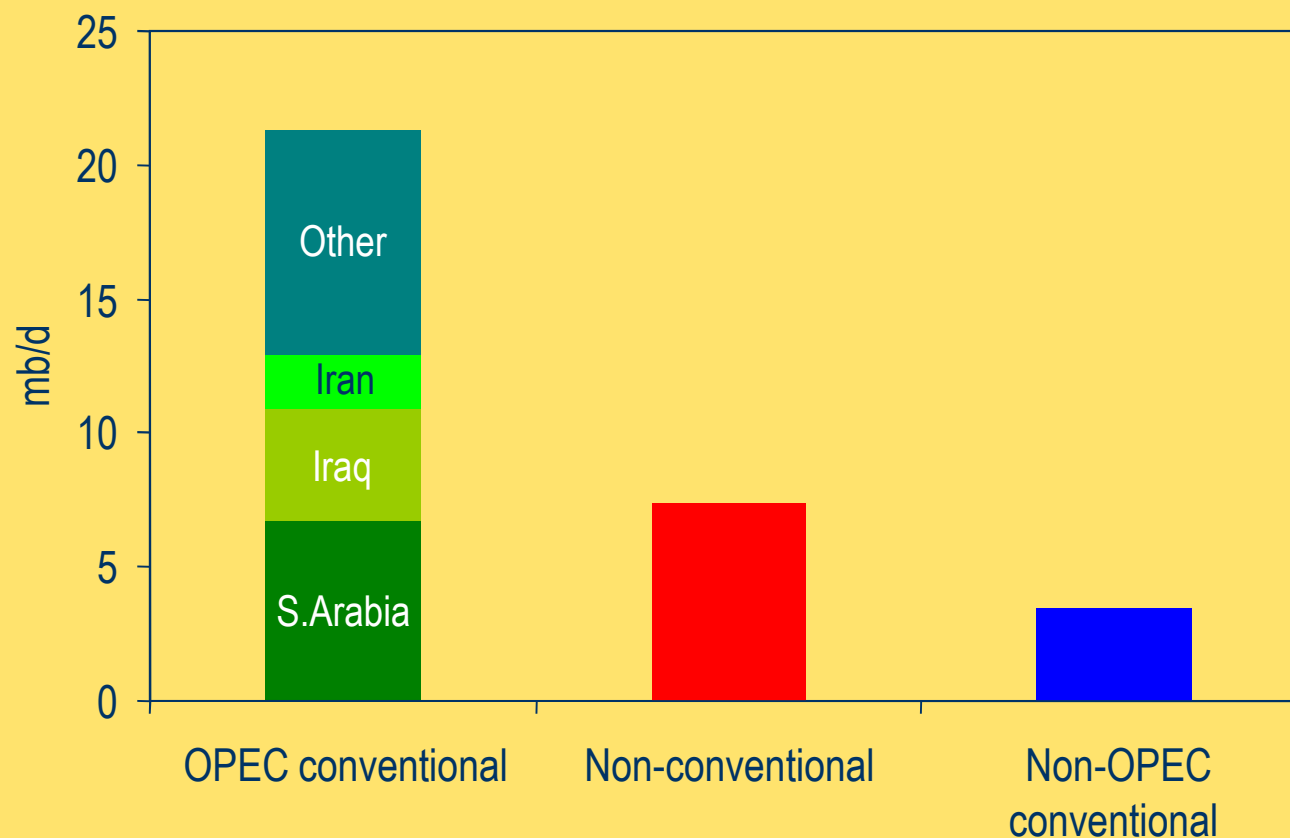
*Dr. Fatih Birol
Chief Economist
International Energy Agency*

The Reference Scenario: World Primary Energy Demand



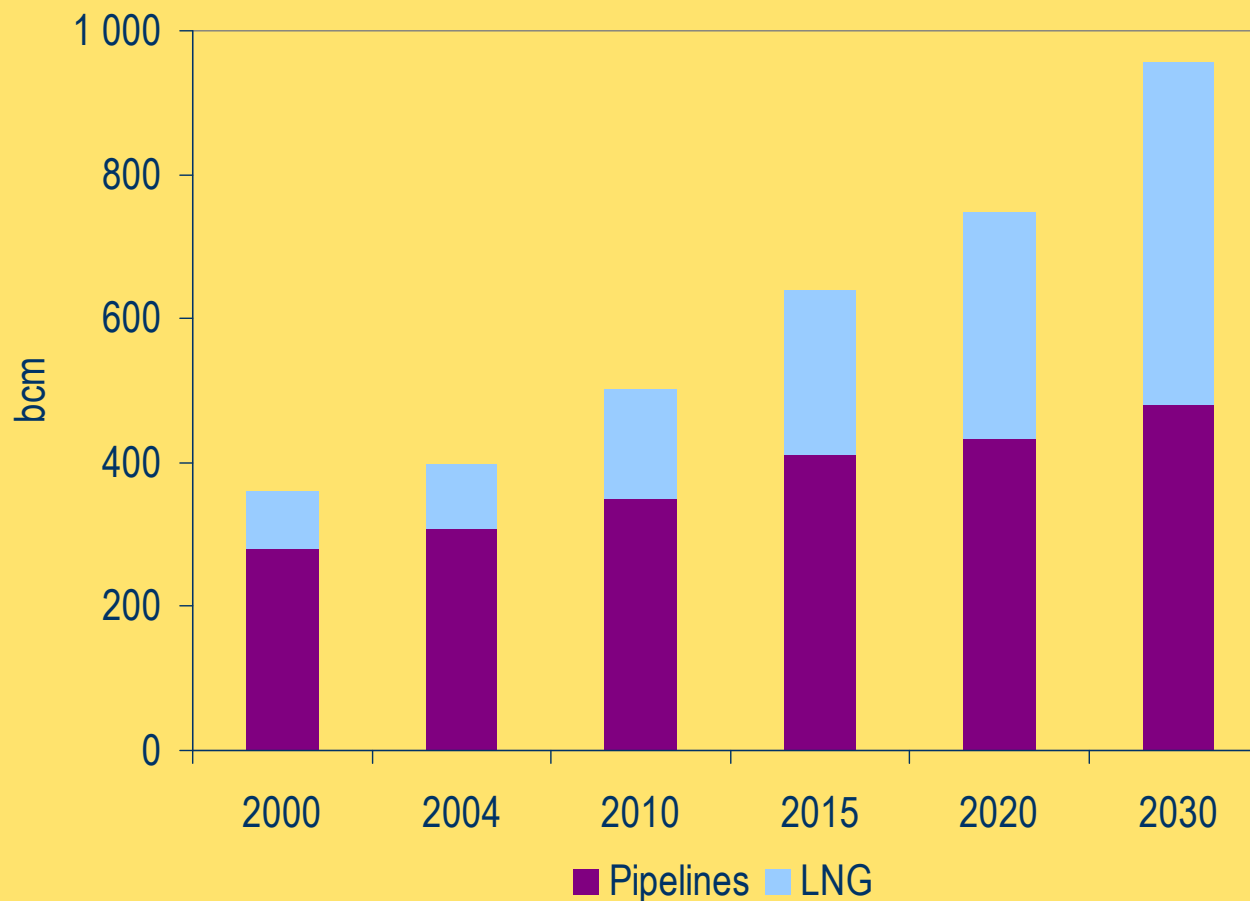
Global demand grows by more than half over the next quarter of a century, with coal use rising most in absolute terms

Reference Scenario: Increase in World Oil Supply, 2004-2030



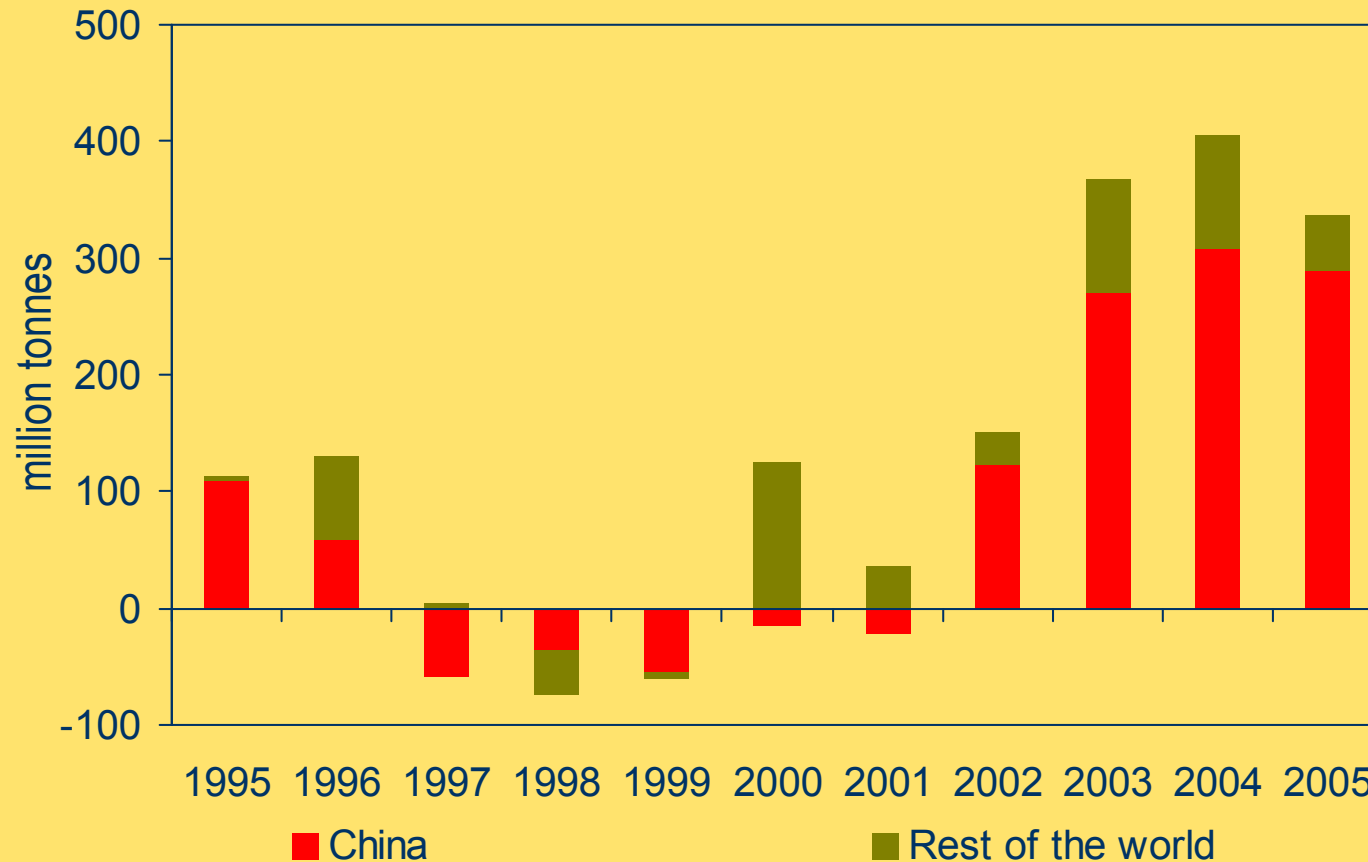
The share of OPEC in world oil supply increases sharply as conventional non-OPEC production peaks towards the middle of next decade

Reference Scenario: World Inter-regional Natural Gas Trade



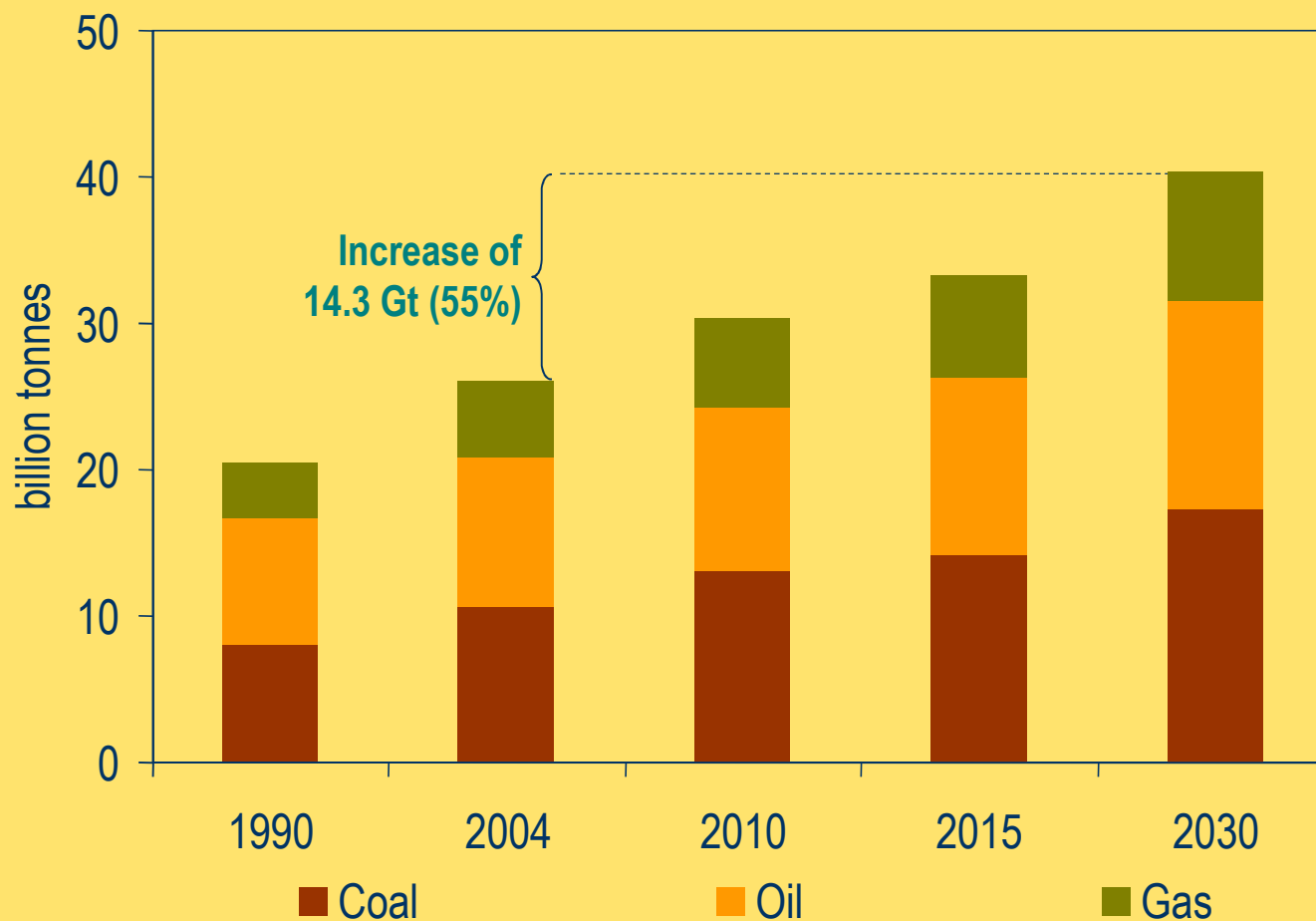
Global gas trade expands by 1.5 times, with two-thirds of the increase coming from Russia, the Middle East & North Africa – mostly as LNG

Annual Increase in Coal Demand



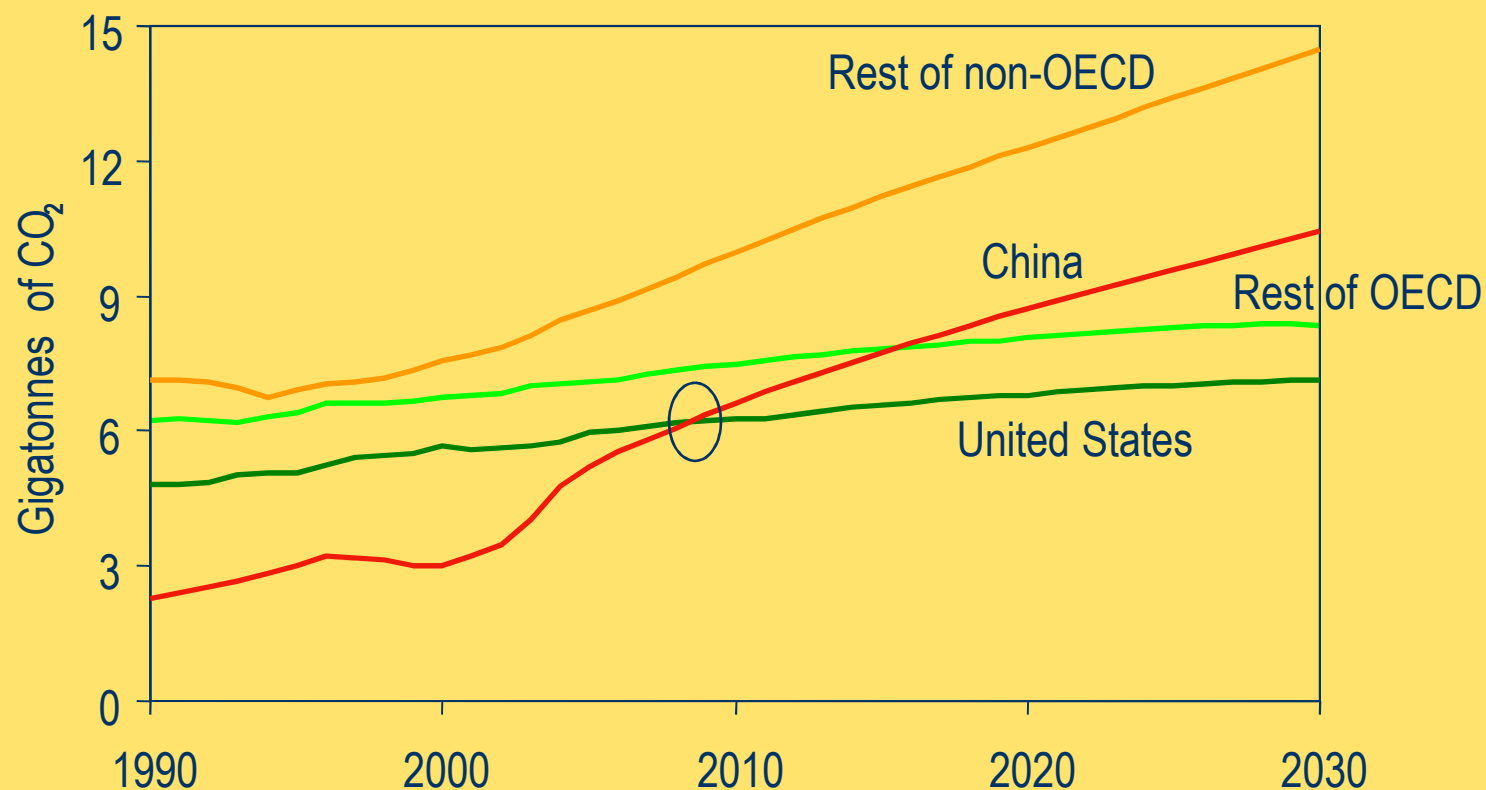
Global coal demand in the recent years has grown much faster than previously – mainly driven by China

Reference Scenario: Energy-Related CO₂ Emissions by Fuel



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

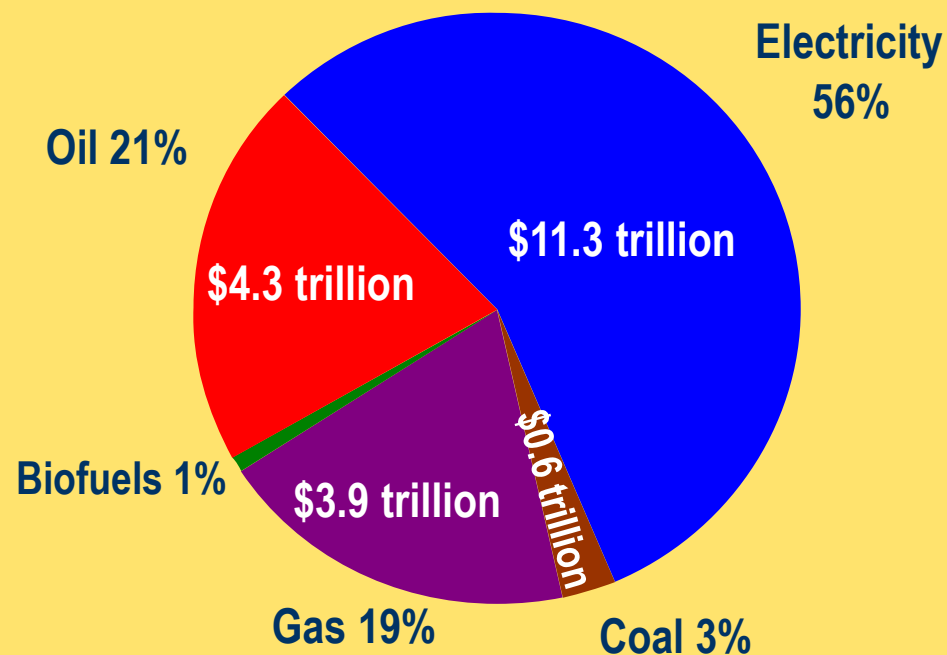
Reference Scenario: Energy-Related CO₂ emissions by Region



China overtakes the US as the world's biggest emitter before 2010, though its per capita emissions reach just 60% of those of the OECD in 2030

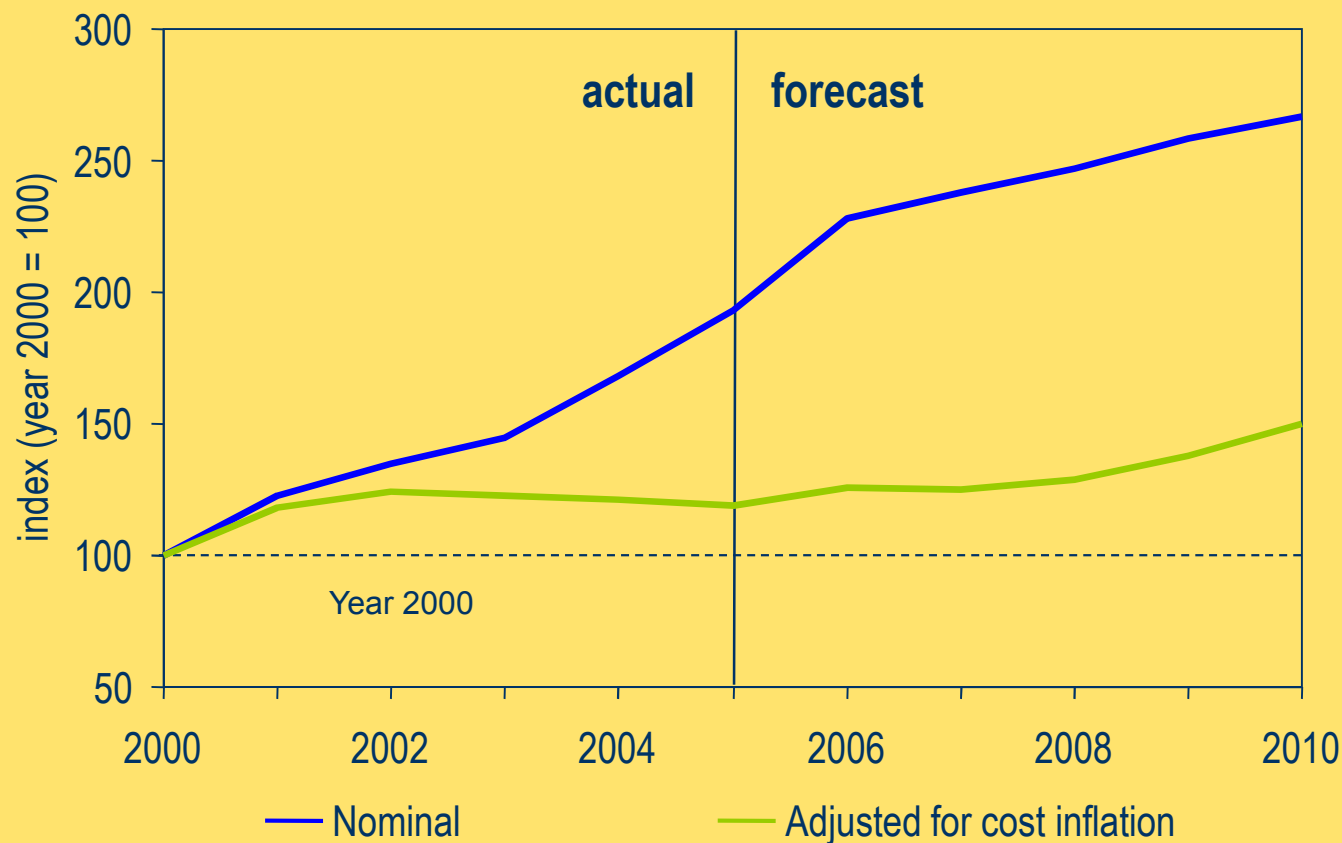
Reference Scenario: Cumulative Investment, 2005-2030

\$20.2 trillion (in \$2005)



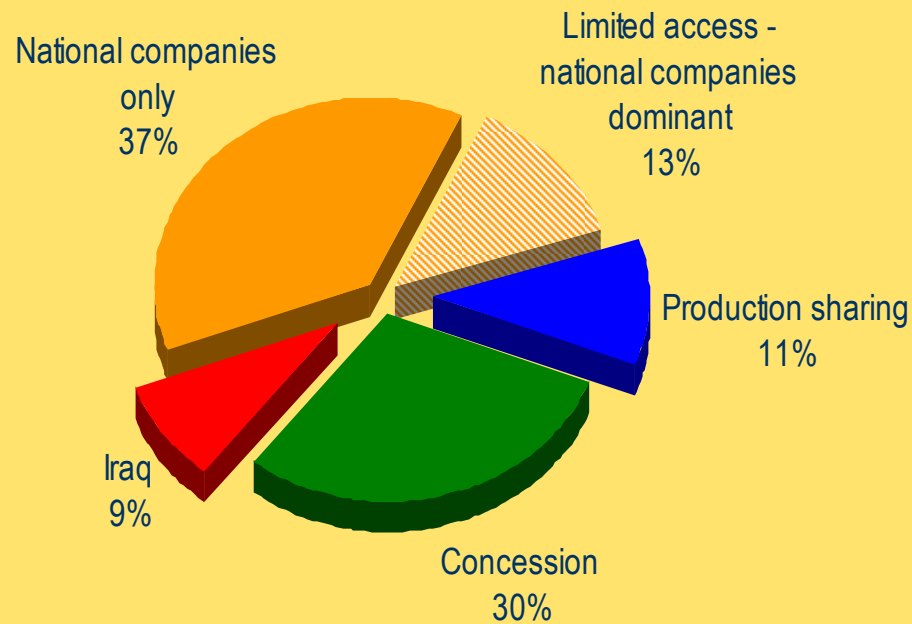
Investment needs exceed \$20 trillion – \$3 trillion more than previously projected, mainly because of higher unit costs

Global Upstream Oil & Gas Investment: Impact of Cost Inflation



Annual upstream investment doubled to \$225 billion between 2000 and 2005, but most of the increase was due to cost inflation

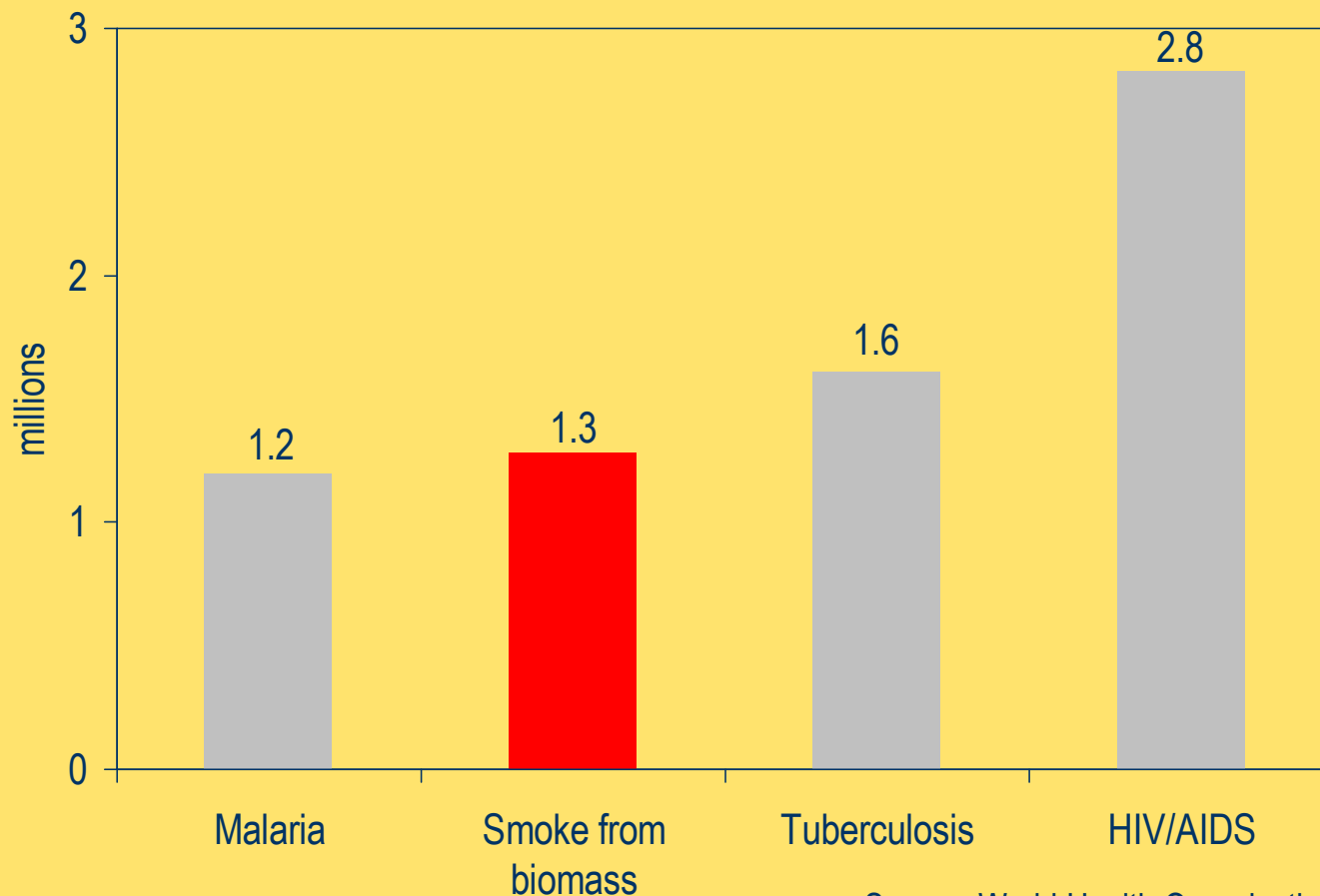
Access to oil reserves



Total reserves = 1 290 billion barrels

Access to much of the world's remaining oil reserves is restricted

Energy Poverty: Annual Deaths from Indoor Air Pollution



Source: World Health Organization

The number of people using dirty traditional biomass for cooking is set to grow from 2.5 billion now to 2.7 billion in 2030 absent new policies

The Energy Future Absent New Policies

- Security of oil supply is threatened
 - *Oil production in non-OPEC countries is set to peak*
 - *Production will be increasingly concentrated in a small number of countries*
- Gas security is also a growing concern
 - *Europe's production has already peaked - US to follow*
 - *Import dependence in both regions & other key regions will grow absent new policies*
- Investment over the next decade will lock in technology that will remain in use for up to 60 years



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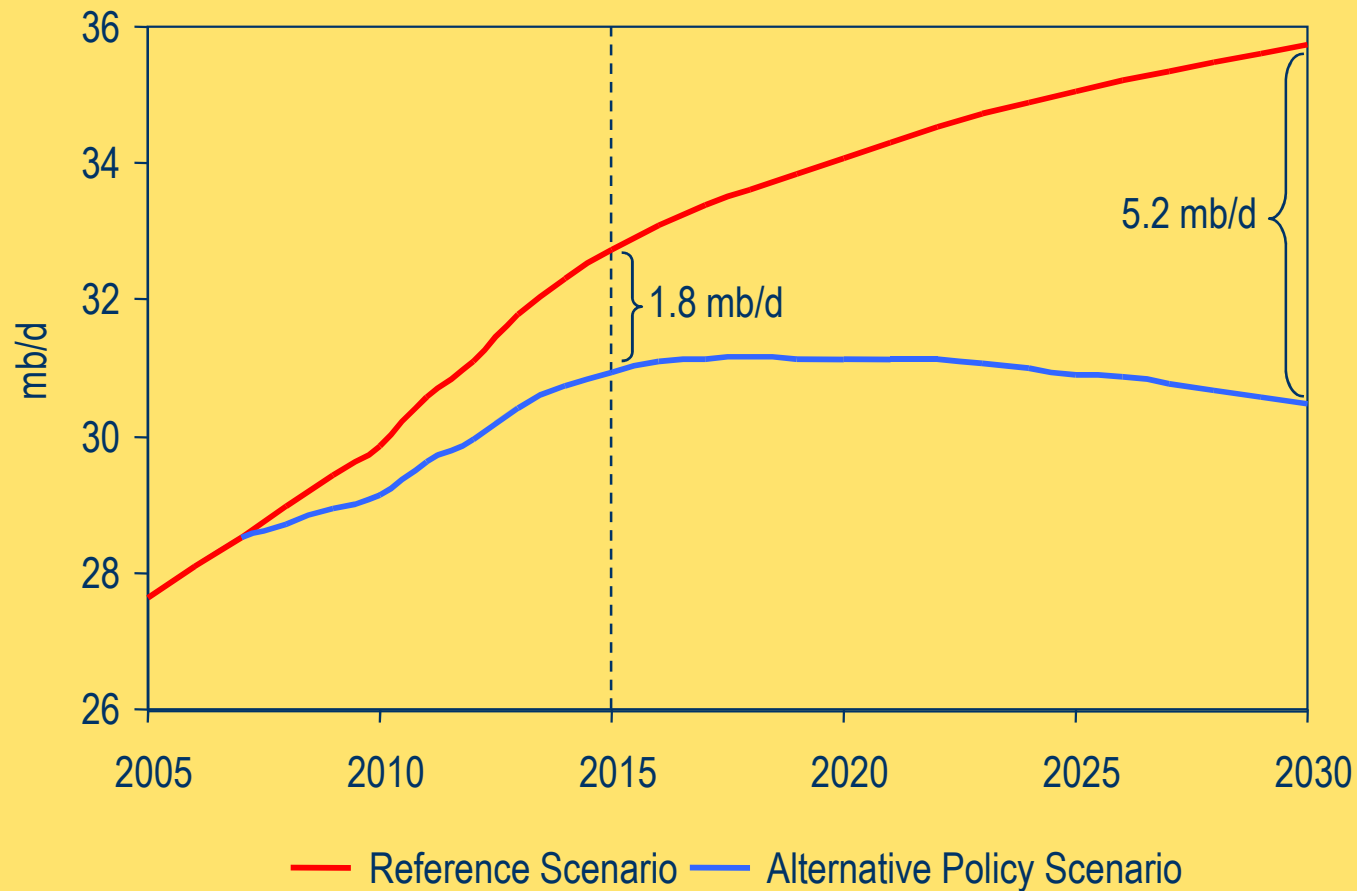


Alternative Policy Scenario

Alternative Policy Scenario: Mapping a Better Energy Future

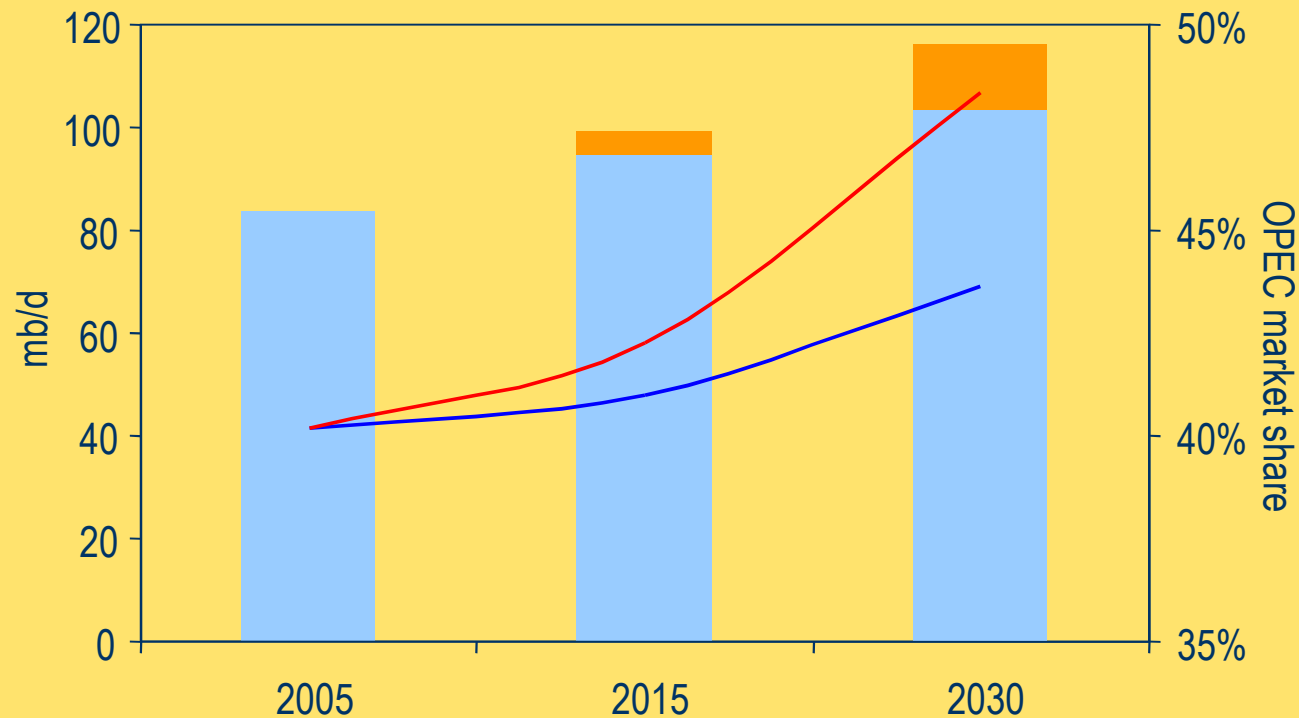
- Analyses impact of government policies under consideration to enhance security & curb emissions
- Demonstrates that we can significantly reduce growth in energy demand & emissions and stimulate alternative energy production
 - *Oil demand is reduced by 13 mb/d in 2030 - equivalent to current output of Saudi Arabia & Iran*
 - *Oil savings in 2015 savings reach 5 mb/d*
 - *CO₂ emissions are 6.3 Gt (16%) lower in 2030 – equivalent to the current emissions of US and Canada*
- Delaying action by 10 years would reduce the impact on emissions in 2030 by three-quarters

Alternative Policy Scenario: OECD Oil Imports



In stark contrast with the Reference Scenario, OECD oil imports level off soon after 2015 & then begin to decline

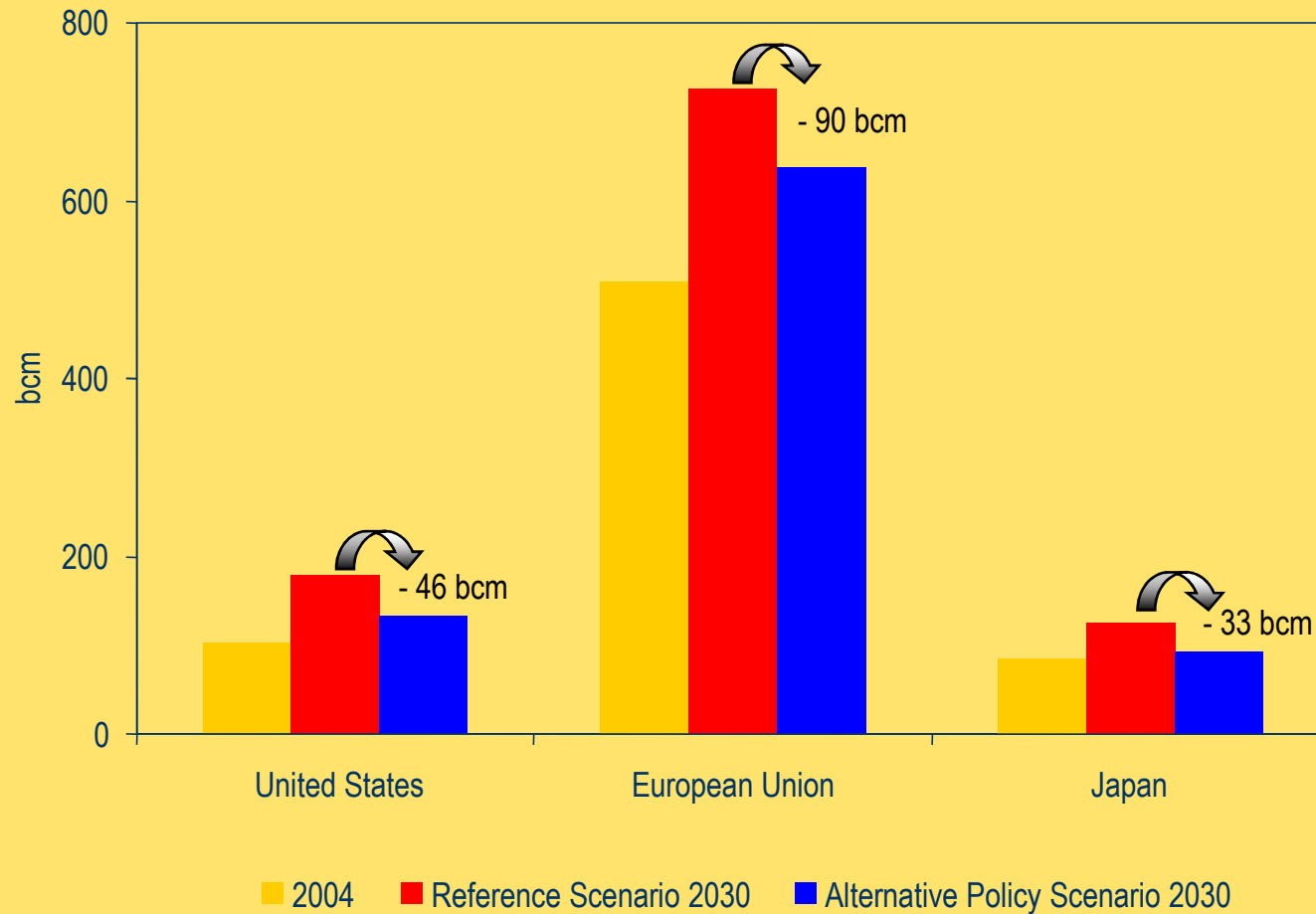
The Alternative Policy Scenario: Global Oil Supply



■ Alternative Policy Scenario ■ Reduction compared with Reference Scenario
— OPEC share in APS (right axis) — OPEC share in RS (right axis)

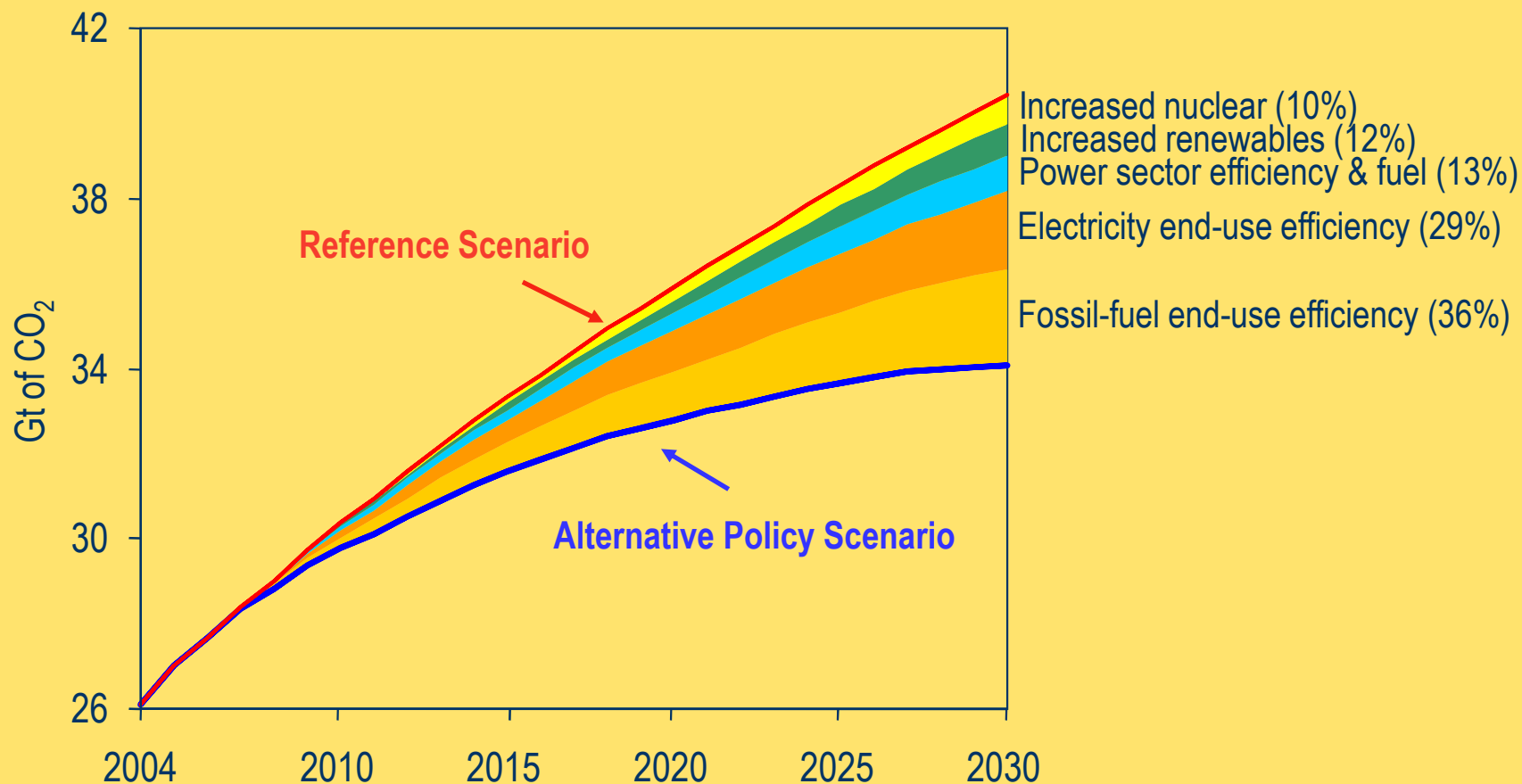
OPEC's share of global oil production rises from 40% now to 43% in 2030 in the APS, compared with a jump to 49% in the RS

The Alternative Policy Scenario: Gas Imports, 2004-2030



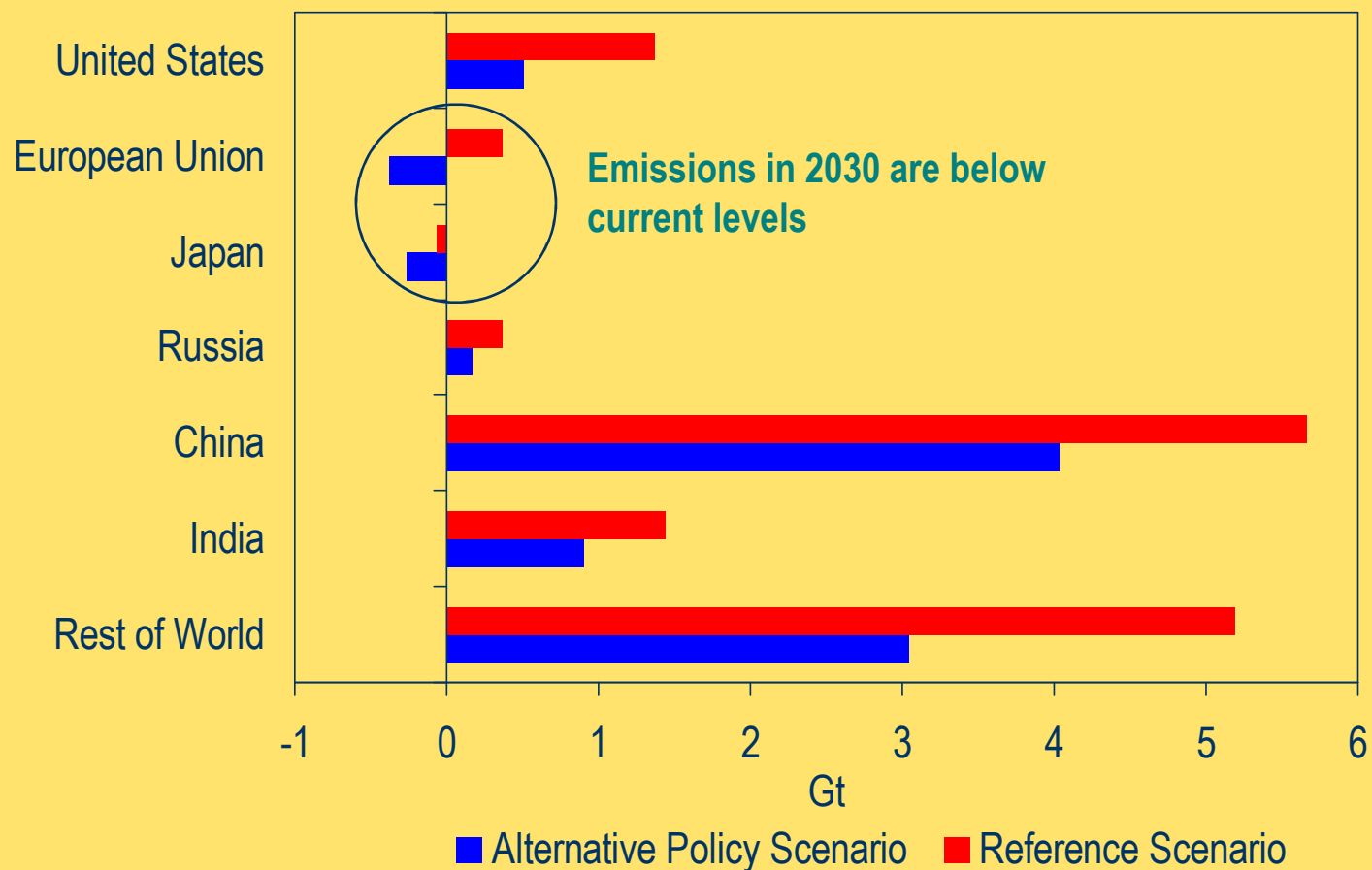
Gas imports in the main consuming regions are significantly lower in the APS compared with the RS

The Alternative Policy Scenario: Key Policies for CO₂ Reduction



Improved end-use efficiency accounts for over two-thirds of avoided emissions in 2030 in the APS

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



Emissions in OECD countries peak by 2015 and then decline – to below current levels by 2030 in the EU & Japan

The Alternative Policy Scenario : Key policies that Make a Global Difference

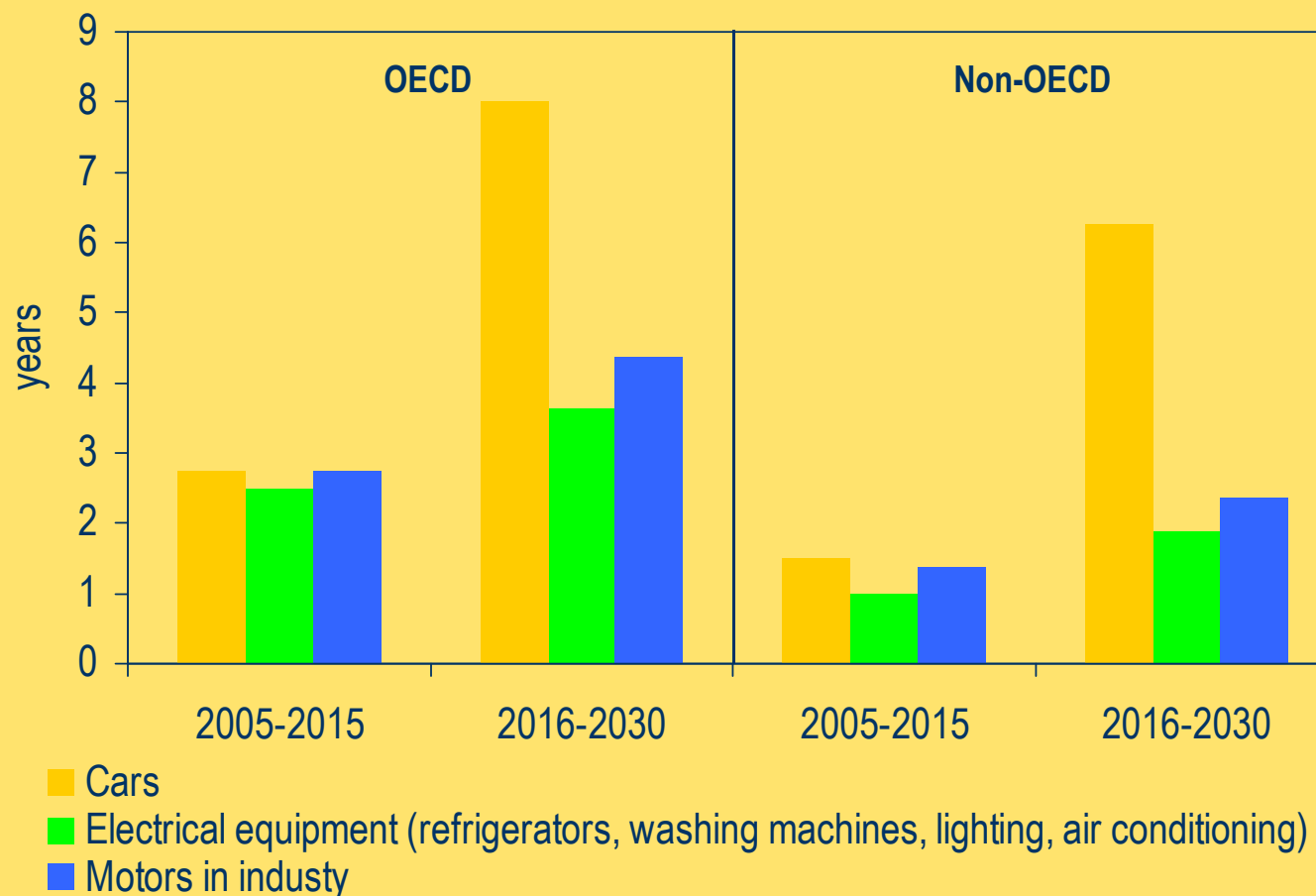
	<i>Energy efficiency</i>	<i>Power generation</i>
US	<ul style="list-style-type: none"> ● Tighter CAFE standards ● Improved efficiency in residential & commercial sectors 	<ul style="list-style-type: none"> ● Increased use of renewables
EU	<ul style="list-style-type: none"> ● Increased vehicle fuel economy ● Improved efficiency in electricity use in the commercial sector 	<ul style="list-style-type: none"> ● Increased use of renewables ● Nuclear plant lifetime extensions
China	<ul style="list-style-type: none"> ● Improved efficiency in electricity use in industry ● Improved efficiency in electricity use in the residential sector 	<ul style="list-style-type: none"> ● Increased efficiency of coal-fired plants ● Increased use of renewables ● Increased reliance on nuclear

A dozen policies in the US, EU & China account for around 40% of the global emissions reduction in 2030 in the Alternative Policy Scenario

The Alternative Policy Scenario: Cost Effectiveness of Policies

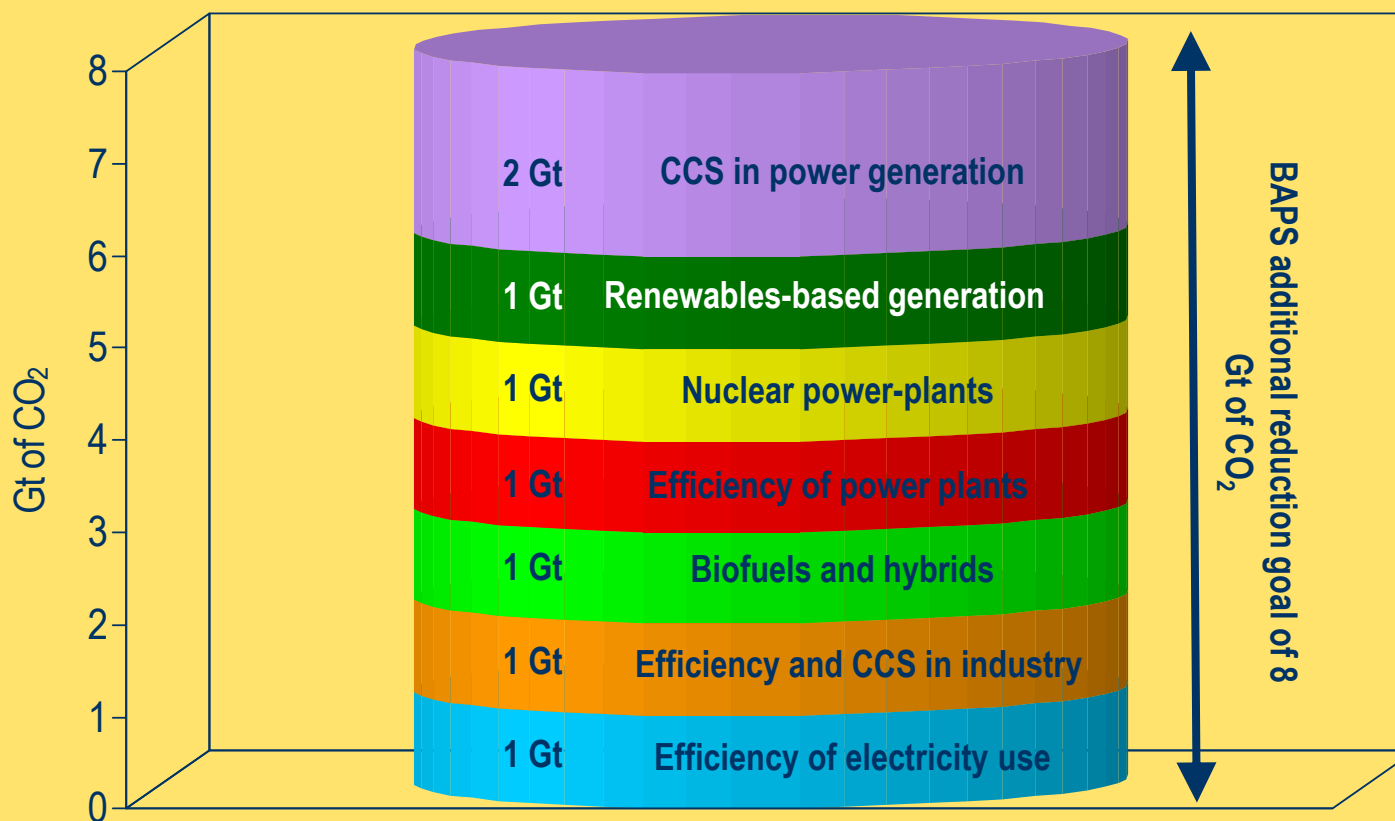
- Total energy investment – from production to consumption – are lower than in the RS
- Consumers spend \$2.4 trillion *more* in 2005-2030 in more efficient cars, refrigerators etc
- ..but producers need to spend almost \$3 trillion *less*
 - *Each \$1 invested in more efficient electrical appliances saves \$2.2 in investment in power plants & networks*
 - *Each \$1 invested in more efficient oil-consuming equipments (mainly cars) saves \$2.4 in oil imports*
- The higher initial investments by consumers are more than outweighed by fuel-cost savings

The Alternative Policy Scenario: Investment Payback Periods



The payback periods of new policies are very short, especially in non-OECD countries for policies introduced before 2015

Going Beyond the Alternative Policy Scenario: BAPS CO₂ Emissions Savings

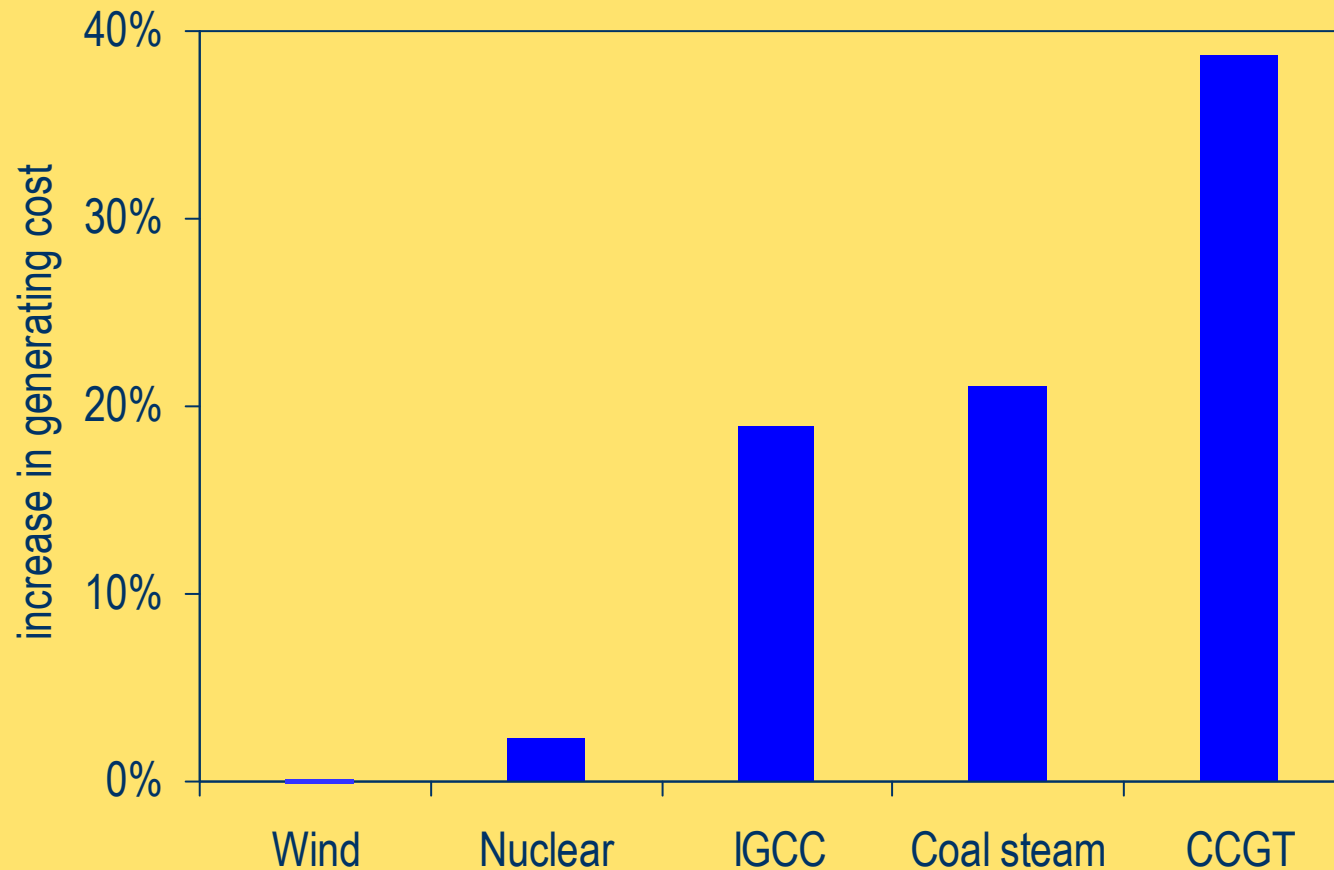


The scale and the speed of the necessary technological change represent a new order of challenge

Renewed Interest in Nuclear Power

- Growing concerns over energy security, surging fossil-fuel prices & rising carbon emissions
- Positive aspects of nuclear power
 - ❑ *proven technology for large-scale baseload electricity generation*
 - ❑ *reduce dependence on imported gas*
 - ❑ *no emissions of greenhouse gases or local pollutants*
 - ❑ *produces electricity at competitive & stable cost*
 - ❑ *uranium resources abundant & widespread*
- But governments need to play a stronger role in facilitating investment where nuclear is accepted

Impact of a 50% Increase in Fuel Price on Generating Costs

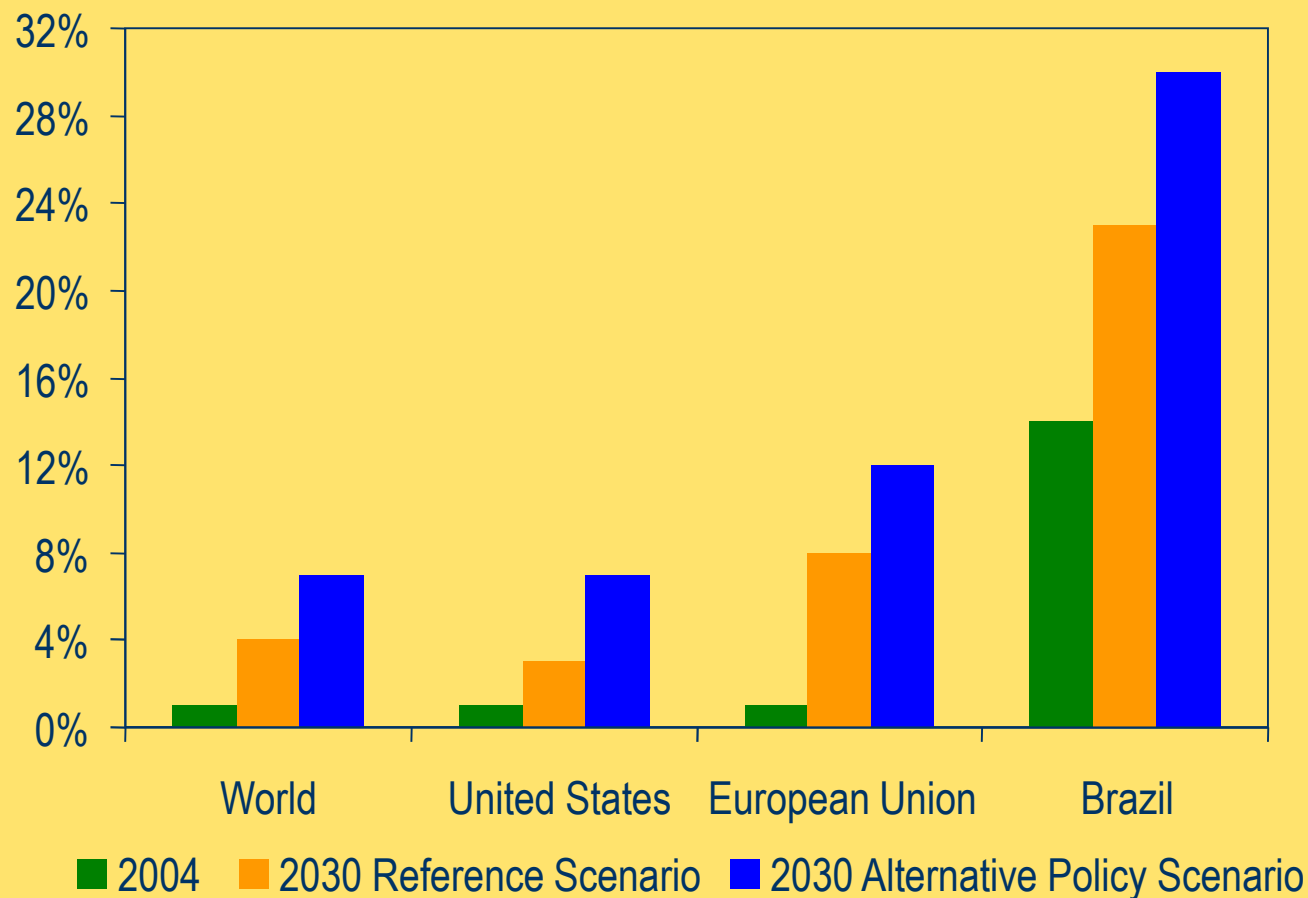


Nuclear generating costs are far less sensitive to fuel price increases than gas or coal plants

Outlook for Biofuels

- Interest in biofuels is soaring
- Biofuels can help address twin threats of growing energy insecurity & climate change through
 - ▣ *Increased diversity of geographic & fuel sources*
 - ▣ *Lower greenhouse-gas emissions - depending on how they are produced*
- Higher oil prices have made biofuels more competitive, but further cost reductions are needed
- Availability of arable land will constrain biofuels potential in the medium term
- Long-term prospects hinge on new technology

Share of Biofuels in Road-Transport Fuel Consumption



Biofuels are set to play a much larger role in meeting world road-transport fuel demand

Summing Up

- The Reference Scenario projects a vulnerable, dirty and expensive global energy system
- The WEO maps out a cleaner, cleverer and more competitive energy future based on alternative policies
- Economic cost of these policies would be more than outweighed by the economic benefits
- Strong political will and urgent government action is needed to create clear incentives to change existing investment patterns