Energy Scenarios

and

Challenges for the World and MENA

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Introduction

- **Major challenge of 21st century:** provide sufficient food, water and energy to allow everyone on the planet to live decent lives, in the face of rising (and increasingly urbanised) population and the threat of climate change

- **Provision of adequate energy is a necessary** (but not sufficient) **means to meet the challenge – it will be hard**

- **Even harder to do so while reducing the use of fossil fuels, which is essential**

i) to reduce pollution

ii) to improve energy security in countries which import large quantities of fossil fuels

iii) to reduce the scale of climate change

iv) because in the (very) long run fossil fuels will become increasingly scarce/expensive

The Scale of the Challenge

- **International Energy Agency 'new policies scenario'**
  - *assumes* successful implementation of all agreed national policies and announced commitments designed to save energy and reduce use of fossil fuels

  Projections for 2010-35:

  Energy use* + 35%, fossil fuels + 26%, CO_2 + 20%

  - almost all from developing countries

  * nuclear + 58%, hydro + 65%, bio-energy + 47% , …

- **BP thinks that *in the shorter period* 2010-30**
  - **energy use will rise 39%**
  - **fossil fuels + 31%, CO_2 + 28%**

The New Policies scenario is not good enough

We must try to do much better

while recognising that the world looks set to do **worse (BP)**

and that *there are scenarios that are worse than BP*

Easy to do better *on paper*:

e.g. IEA and IIASA GEA, which shows cup half full:

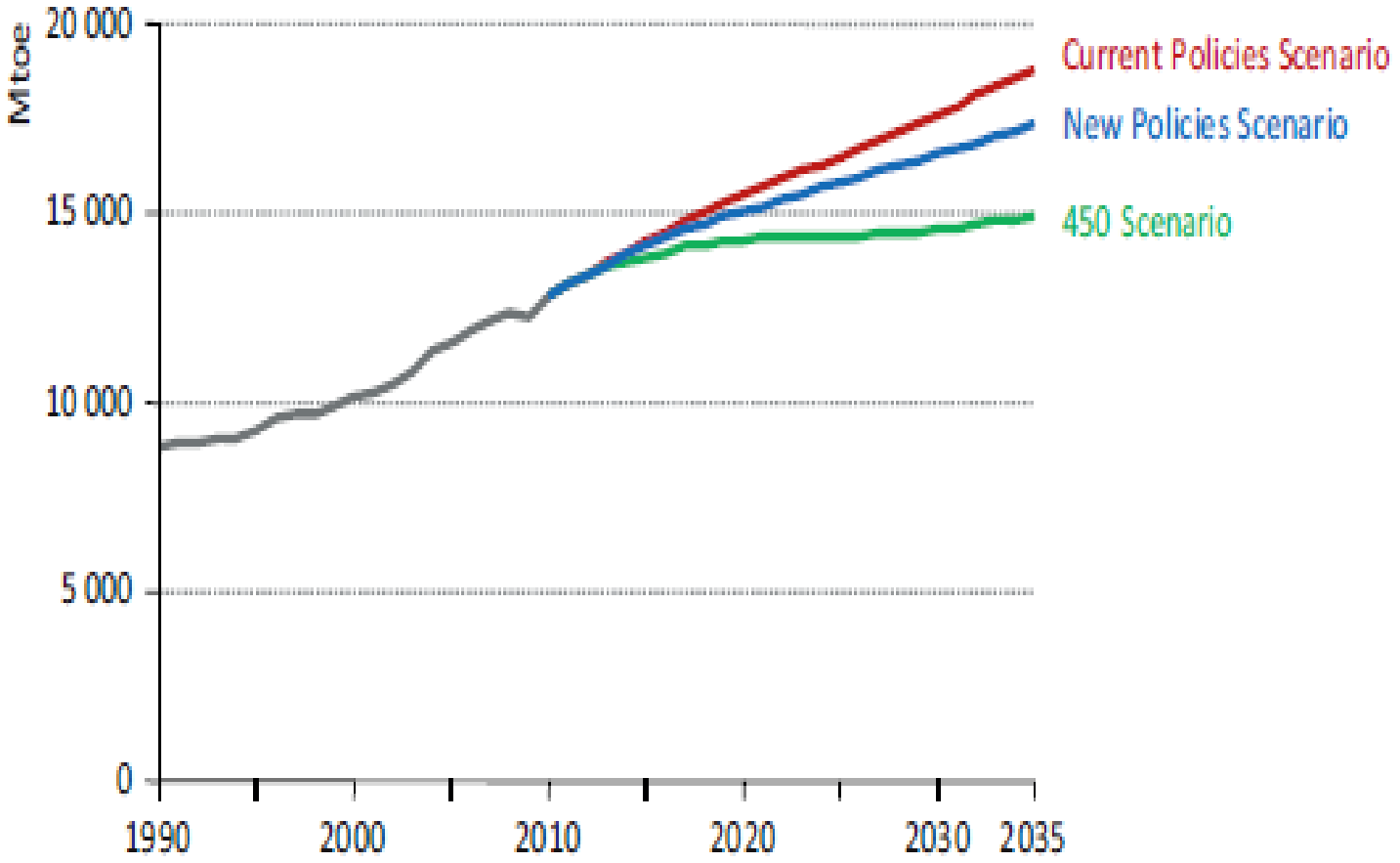
"half the world's new electric generating capacity added during 2008–10 was renewable"

Glass half empty perspective: from 1990 to 2010 –

Renewable generating *output* (excluding hydro) grew by a factor 4.5 but this only took it from 1.5% to 3.6% - *while the contribution of fossil fuels grew from 63.4% to 67.5%*

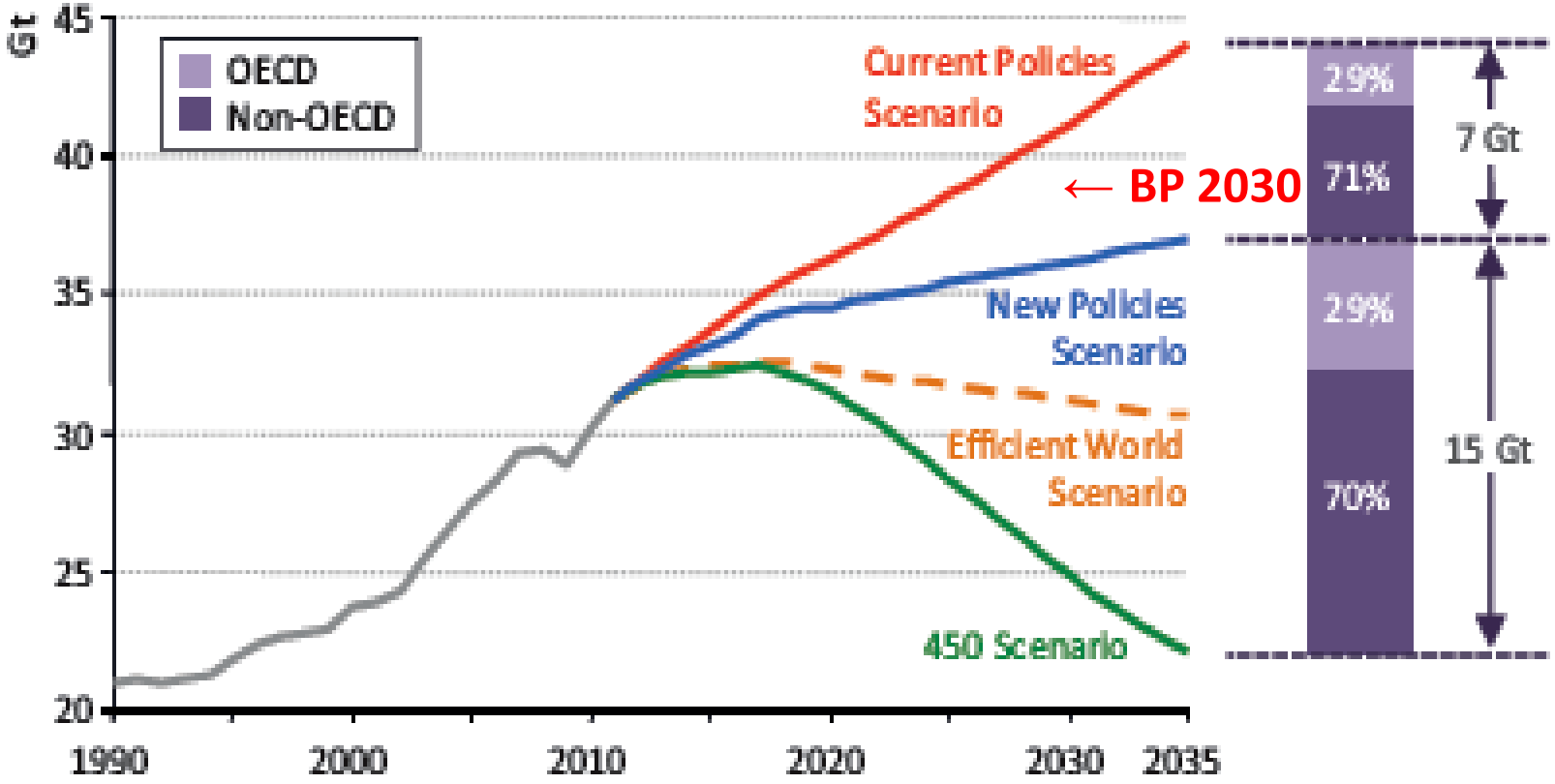
[nuclear & hydro fell in % terms, although all grew in absolute terms as the total went up 81%]

World Primary Energy Demand by Scenario



Source: International Energy Agency

Global Energy-Related Carbon Dioxide Emissions by Scenario



Note: There is also some abatement of inter-regional (bunker) emissions which, at less than 2% of the difference between scenarios, is not visible in the 2035 shares.

Source: International Energy Agency

There are scenarios (J Browne) that are even worse than business as usual as a result of the **shale gas & oil revolution in the USA**

Consequences technically & politically uncertain, BUT:

Perhaps the USA will lead the world in decarbonisation as coal → gas, gas powers trucks, and cheap electricity → rapid introduction of electric vehicles

However coal is much cheaper than gas elsewhere

US coal is not staying in the ground: it is being exported -

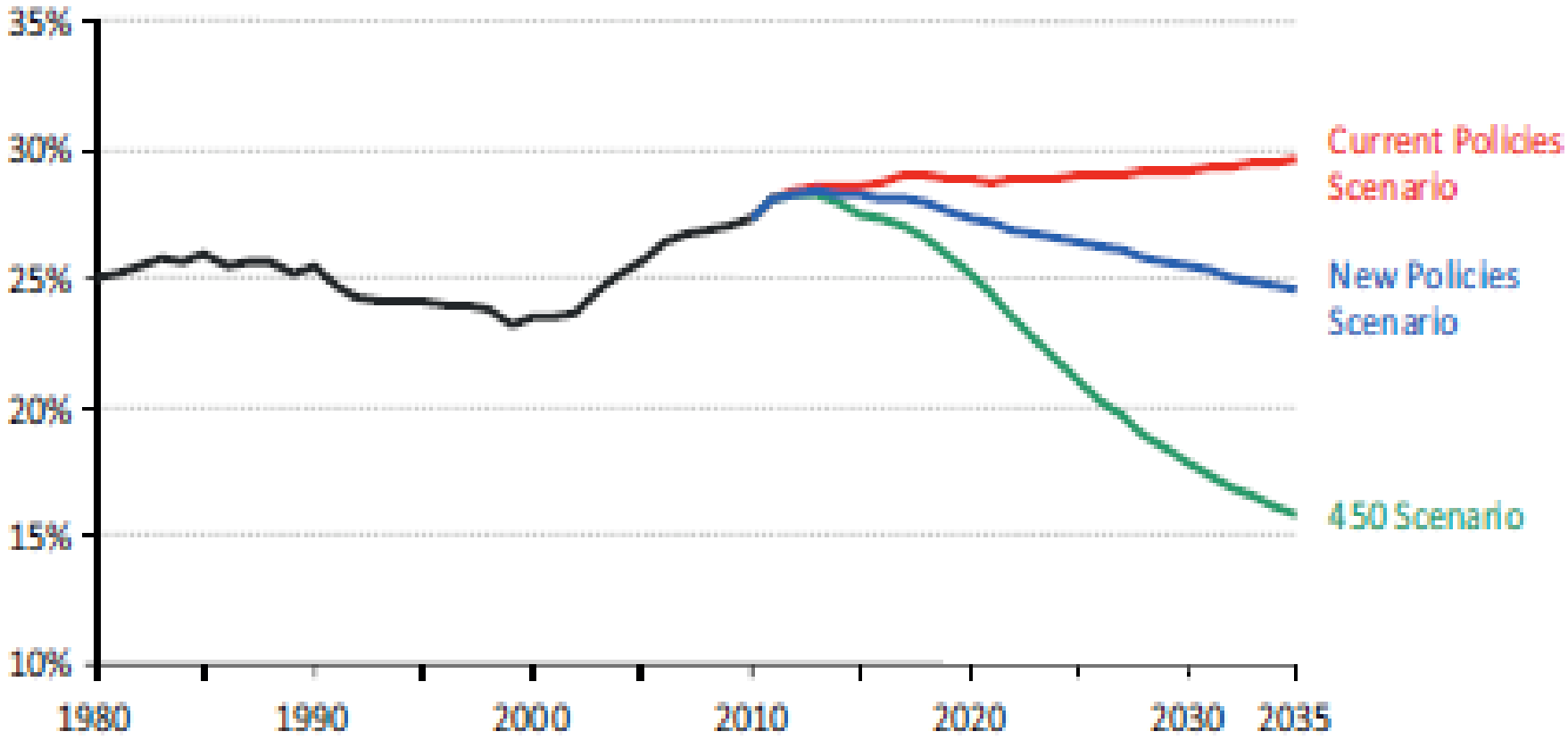
10 GW additional fossil capacity in Germany, planned to replace nuclear, hoped gas:

Recently + 2.2 GW lignite!

Then US coal?

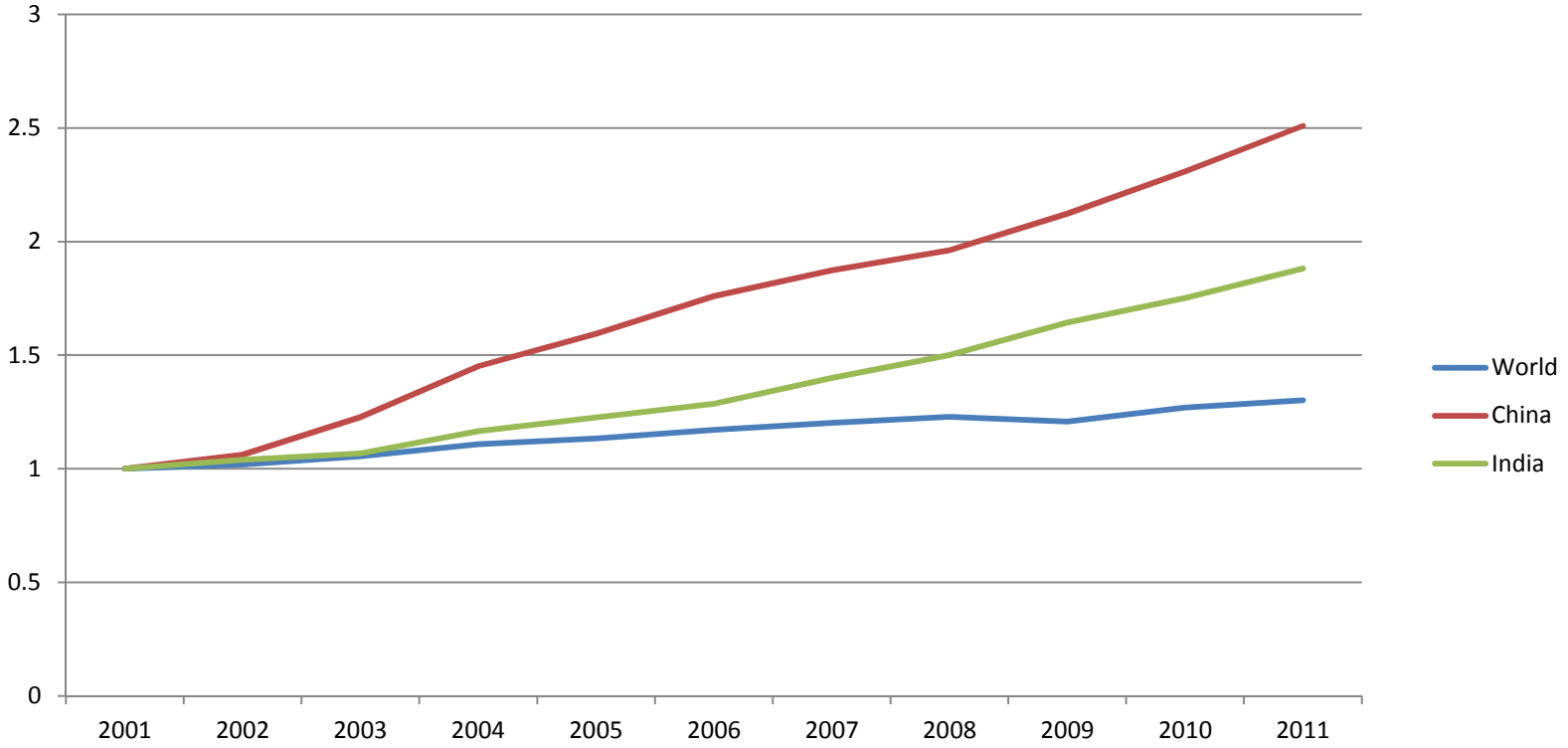
Reducing coal use is vital

Share of Coal in World Primary Energy Demand by Scenario

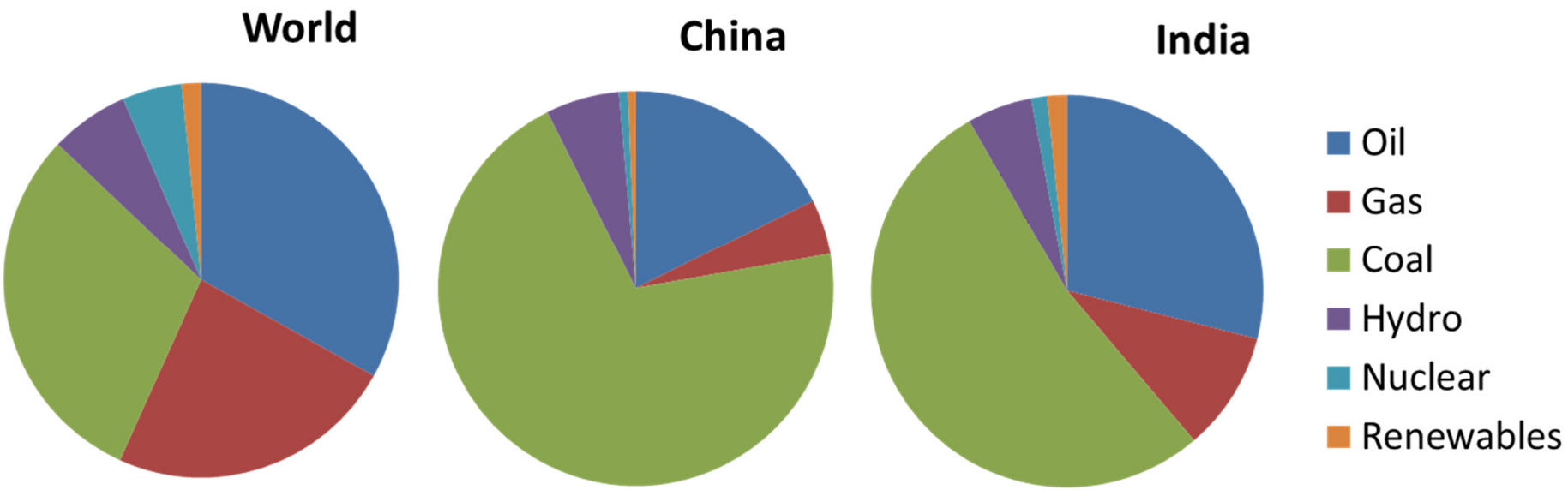


Source: International Energy Agency

Primary Energy Growth in China and India



Growth rate in India (7.4% p.a. 2010/11) is catching up and will overtake rate in China (8.4%), but both will slow in the future, e.g. IEA's New Policies Scenario projects 3.1% p.a. in India, 2.0% p.a. in China for 2009-35



Plus combustible renewables and waste:

10%	9%	24%

Outside View of Energy in the Gulf/MENA Region

- **The Gulf as an energy producer**

  Importance of oil and gas – for the world and for the local economy

- **The Gulf as a** (profligate) **energy consumer**

With thanks to Bassam Fattouh (School of African and Oriental Studies, London, and Oxford Institute for Energy Studies) **for data (NB now a year out of date)**

Conventional Oil

- **The Gulf** is critical for world oil supplies

  → concerns about reliability (→ high level of US public support for nuclear)

- **MENA** → 61% of proven reserves

  → 36% of global production (10% consumed in MENA); ME share rising, as is total

  → 100% of global surplus capacity

88% of Mena reserves in 5 gulf countries:

Saudi Arabia - 32%, Iran - 17%, Iraq - 14%, Kuwait - 13%, UAE -12%,…… Qatar - 3%

Growth potential high: Saudi Arabia, Iraq; medium: Iran, Libya; low: Qatar, Algeria, Abu Dhabi, Kuwait

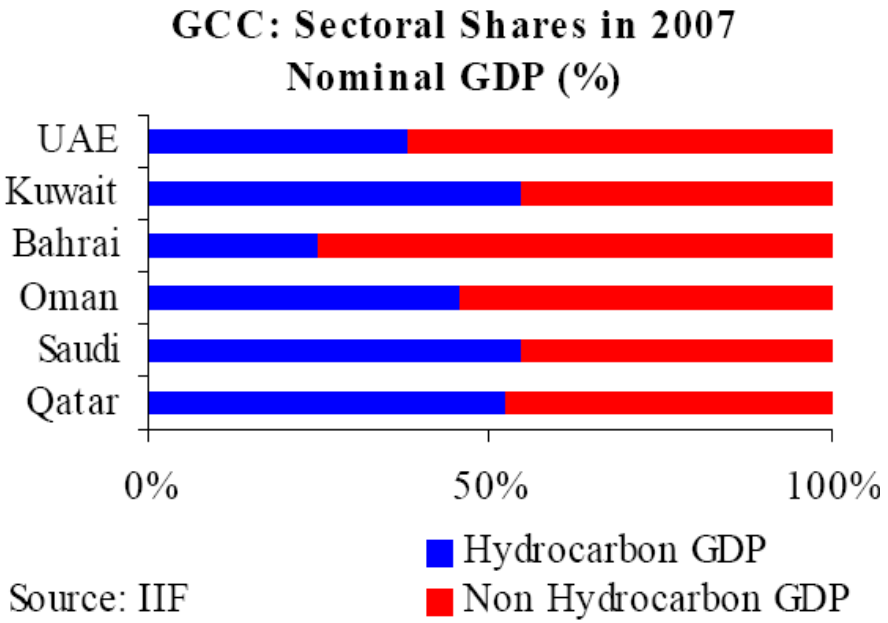
Conventional Gas

- **MENA has 45% of world's proven reserves of conventional gas** and R/P ~ 150 years
- **MENA** is currently a relatively (compared to oil) minor player in gas ~ **19% of world production**, *but (2010) imports from MENA → large % in some EU countries: Spain - 65%, Italy - 48%: both mainly from Algeria; UK - 19% (2010 data: 28% in 2011!) from Qatar*
- Qatar is world's dominant LNG supplier ~ 25% of total (next Indonesia & Malaysia ~ 10% each): exports planned to USA available for Europe & Japan following shale gas expansion. UK takes 18% of exports (next India, Japan and S Korea ~ 14% each)
- Paradoxically **most MENA countries face gas shortages** (many curtailing exports) due to

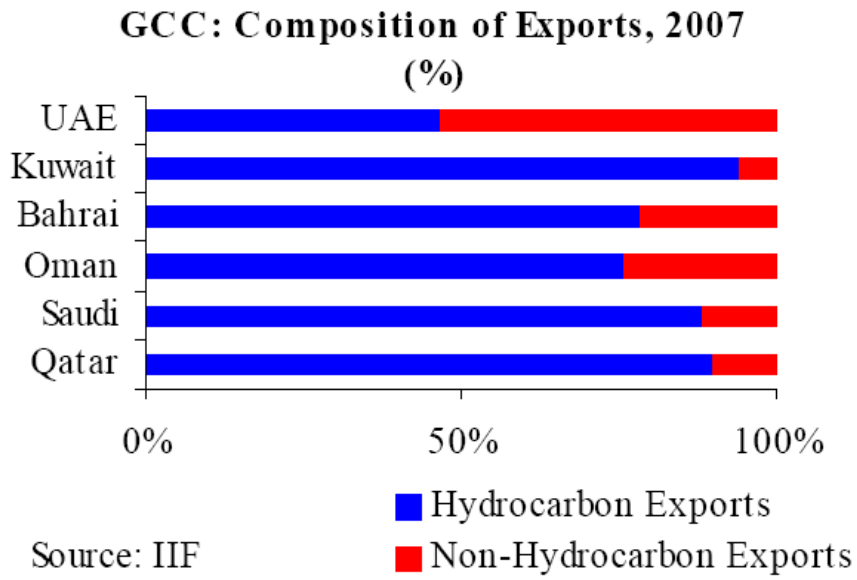
  low prices → little incentive supply domestic markets

  + rapid increase in domestic demand: power generation and desalination; economic development/diversification strategy; gas pricing policy

The Elusive Goal of Diversification



Source: IIF



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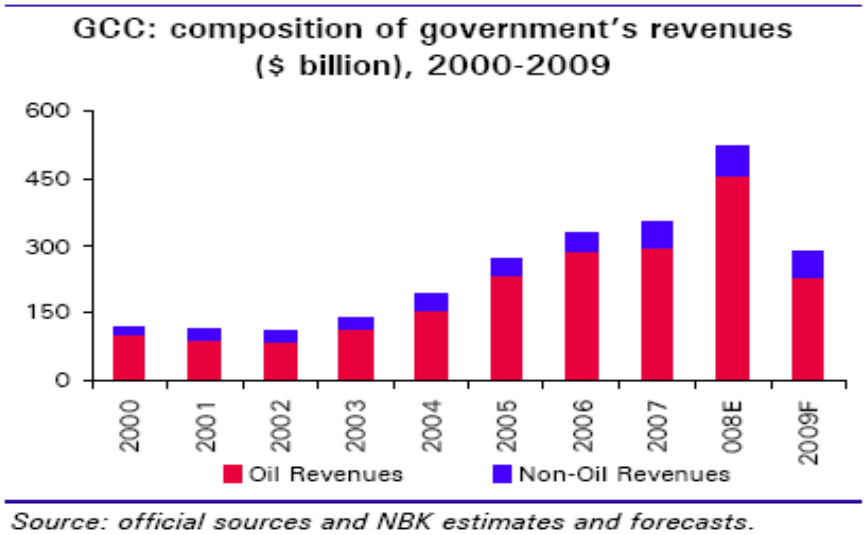


Source: official sources and NBK estimates and forecasts.

Energy Consumption in MENA/the Gulf

- **MENA is an increasingly important consumer of oil* and gas****

  * 3% (1980) → 9% (2009) of global consumption

  ** 3% (1980) → 14% (2009) of global consumption

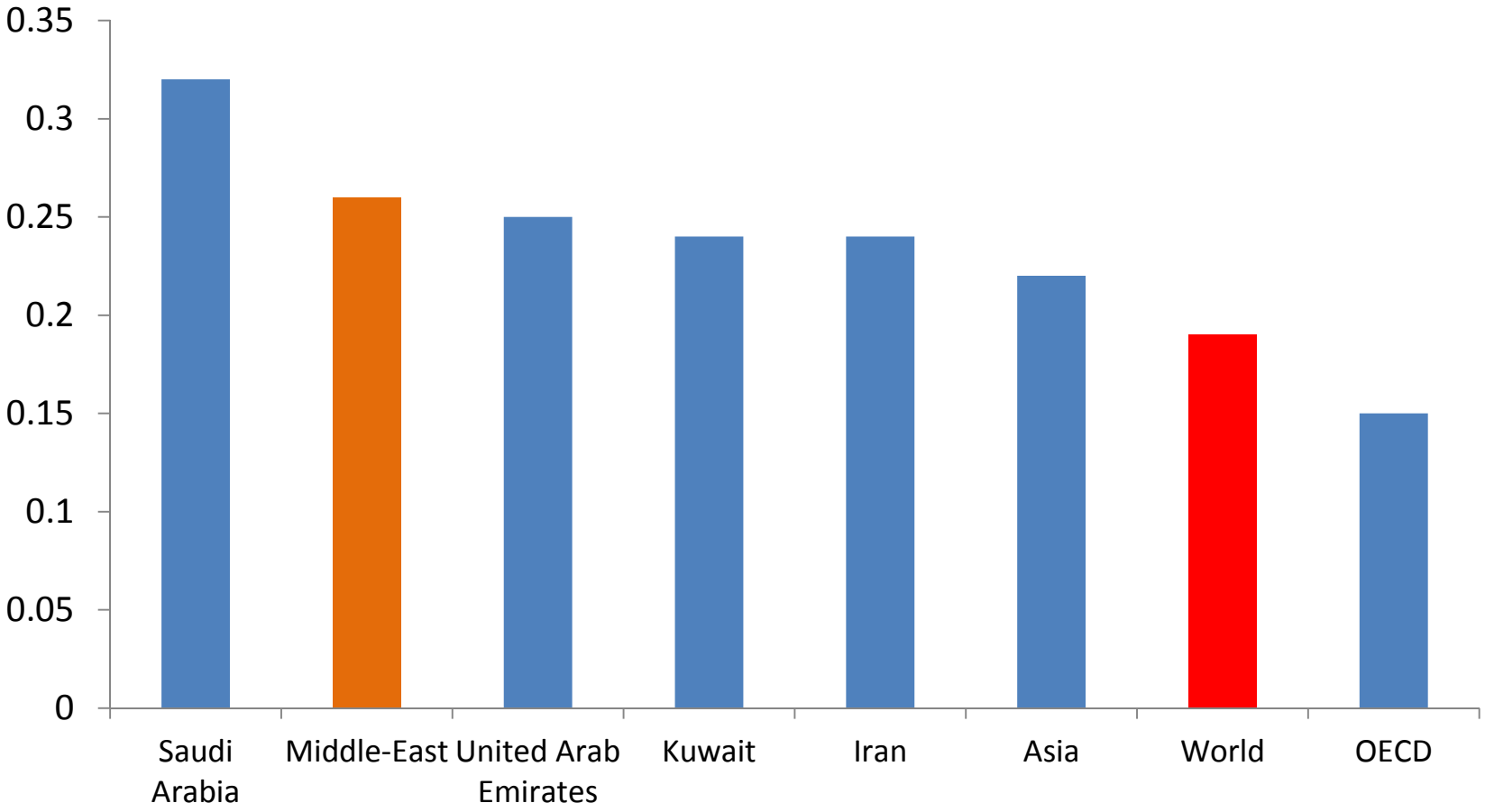
- **Energy intensity (consumption/GDP) is largest in the world, and rising rapidly**

- World's largest per capita energy use in Qatar (960% of world average); **6 GCC countries all in 'top' 18** (Oman 18th at 2.9xWA; Middle East as a whole and UK neck and neck at 1.72/1.77xWA)

  due to low prices (no taxes and large subsidies)

Most Energy Intensive Region in World

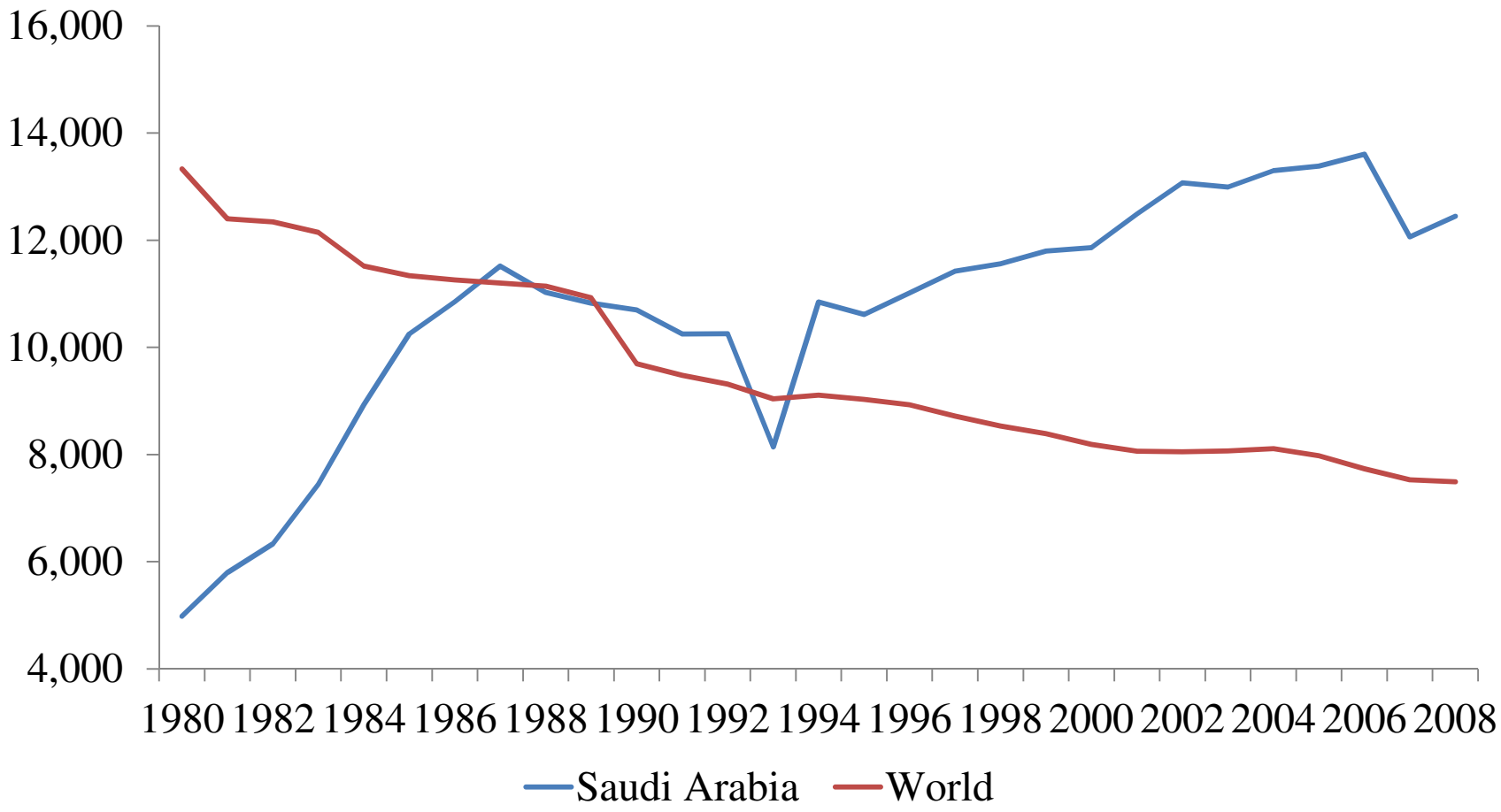
Energy Intensity (KOE/GDP per capita 2005 (PPP)



Source: ENERDATA

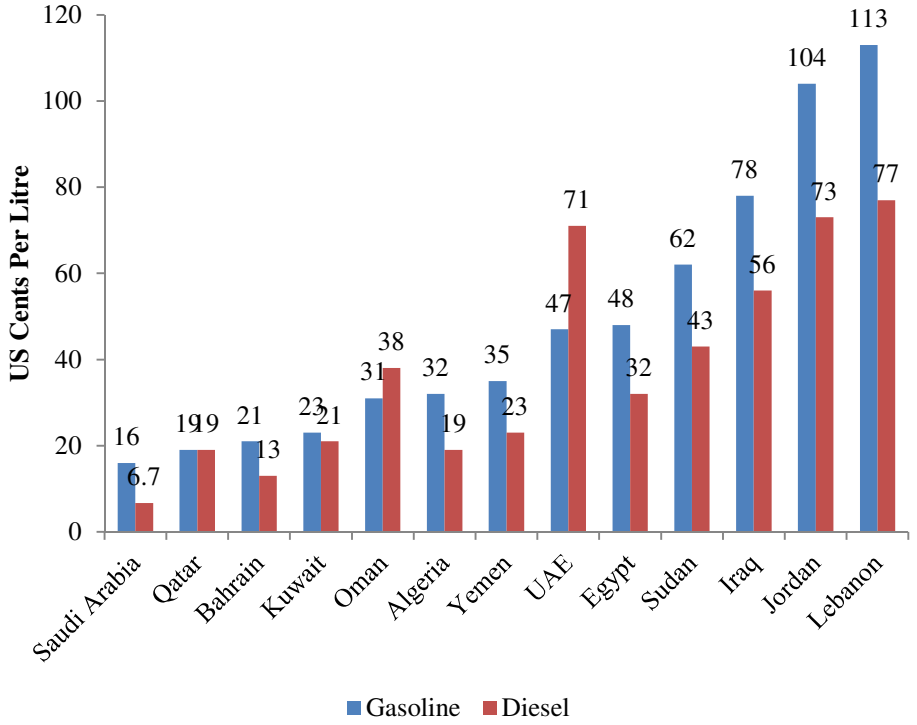
Energy Intensity Rising Against World Trend

Total Primary Energy Consumption per Dollar of GDP

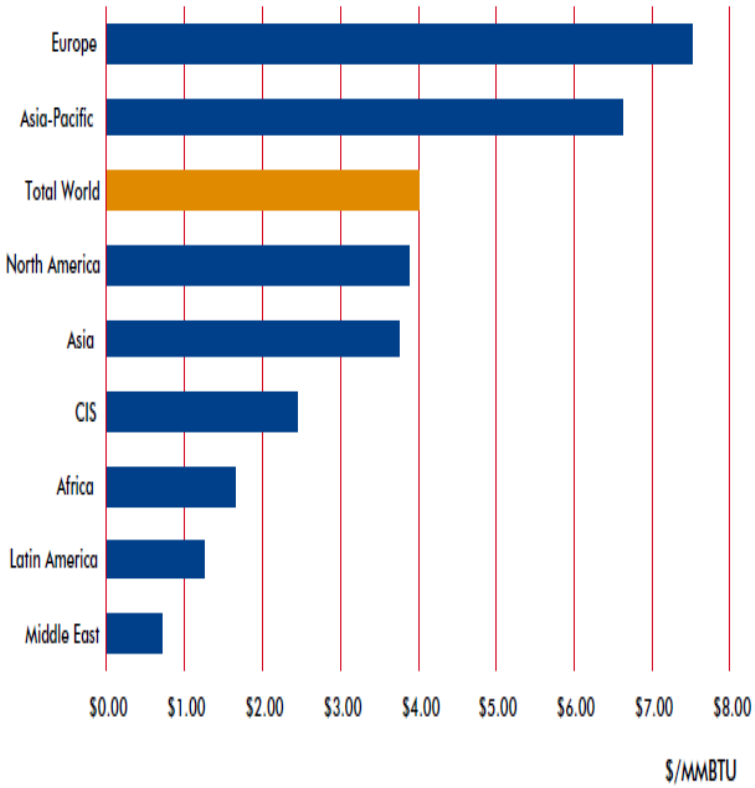


Low Energy Prices

Retail Gasoline and Diesel Prices in Selected Arab Countries, November 2010



Average Wholesale Gas Prices by Region, 2009



Middle East region has the lowest domestic petroleum products and gas prices in the world

Personal Conclusions on the Gulf Scene

- Need to diversify the economy and (in anticipation of the eventual end of the fossil fuel era, and to combat climate change) the energy supply (→ solar, nuclear,…)

- Demand management (planning), improved energy efficiency and *removal of subsidies (transfer oil & gas rents to cash hand-outs) should be priorities*

Interesting to see if speakers from the region agree!

Necessary Actions -Technical

- **Carbon Capture and Storage** *(if feasible, safe, cost-effective)*

- **Reduce energy use/improve efficiency**

- in principle can reduce the growth in world energy use, and save a lot of money, **but** unlikely to reduce total use, *assuming* continued rise in living standards in the developing world

- **Develop and expand low carbon energy sources**

- **need everything we can sensibly get**, but without major contributions from solar and/or nuclear (fission and/or fusion) it will not be possible to replace the 14 TW currently provided by fossil fuels
- **Drive down costs**

Challenge: devise economic tools and ensure the political will to make this happen. **Meanwhile**: replace coal with gas

Necessary Actions - Policy

- **Better planning to reduce demand –** *especially in growing cites/developing countries*
- **Stronger regulations**
- **Phase out $523 billion/year of subsidies for consumption of fossil fuels** (only 8% benefits world's 20% poorest)
- **Carbon tax** (provides more certainty than cap and trade) + in the absence of global agreement: **B**order **C**arbon **A**djustments
- **Increase $88 billion/year subsidies to launch* new not yet cost-effective energy sources and efficiency measures** *then phase out
- **Increase long-term publicly funded R&D** (currently $25 billion/year)