

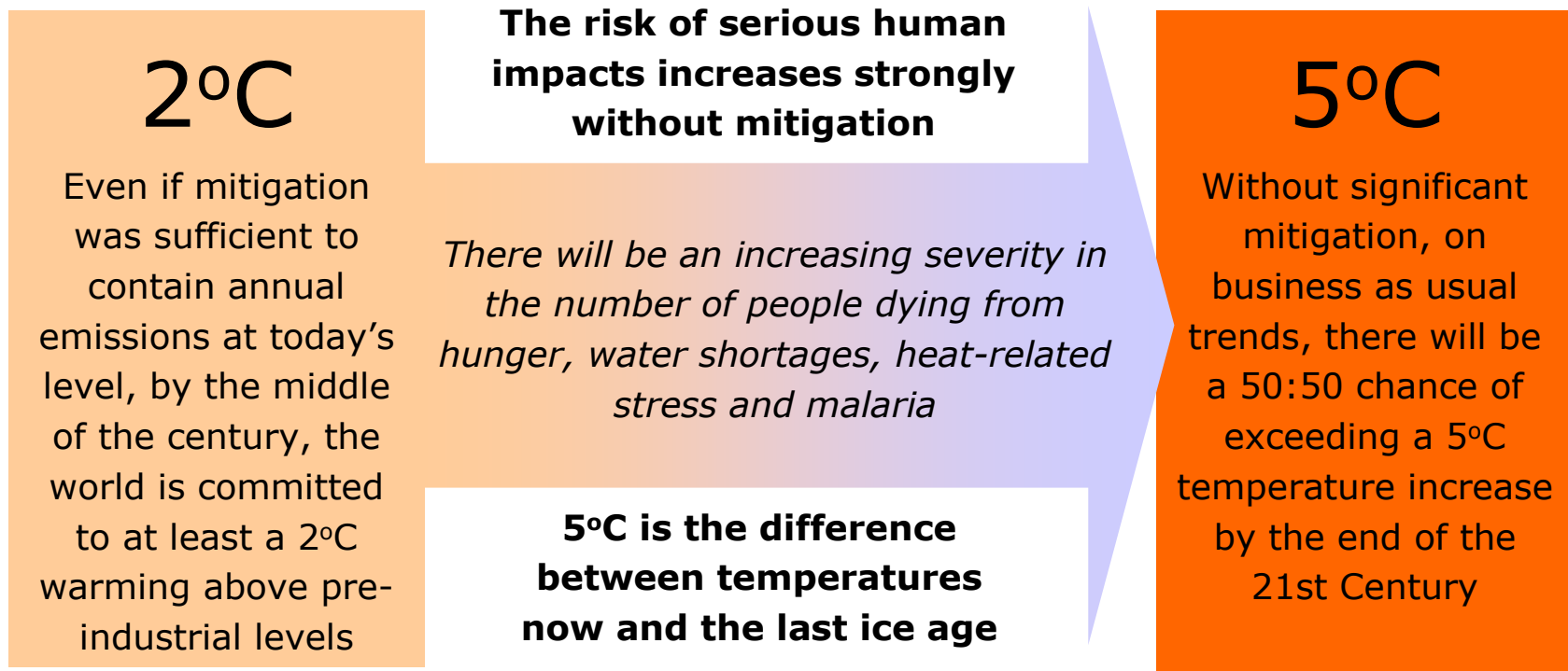


Willy Rickett

DG Energy,
Department of Trade and Industry (DTI),
UK Government

Our science summary report demonstrates a resounding consensus on climate change science

- **Global warming is real:** average surface temperature has increased by 0.7°C since around 1900, a rate and scale likely to have been greater than at any time in at least the past 1000 years
- **Global warming is man-made:** most of the warming over the last 50 years is attributable to greenhouse gases from human activities



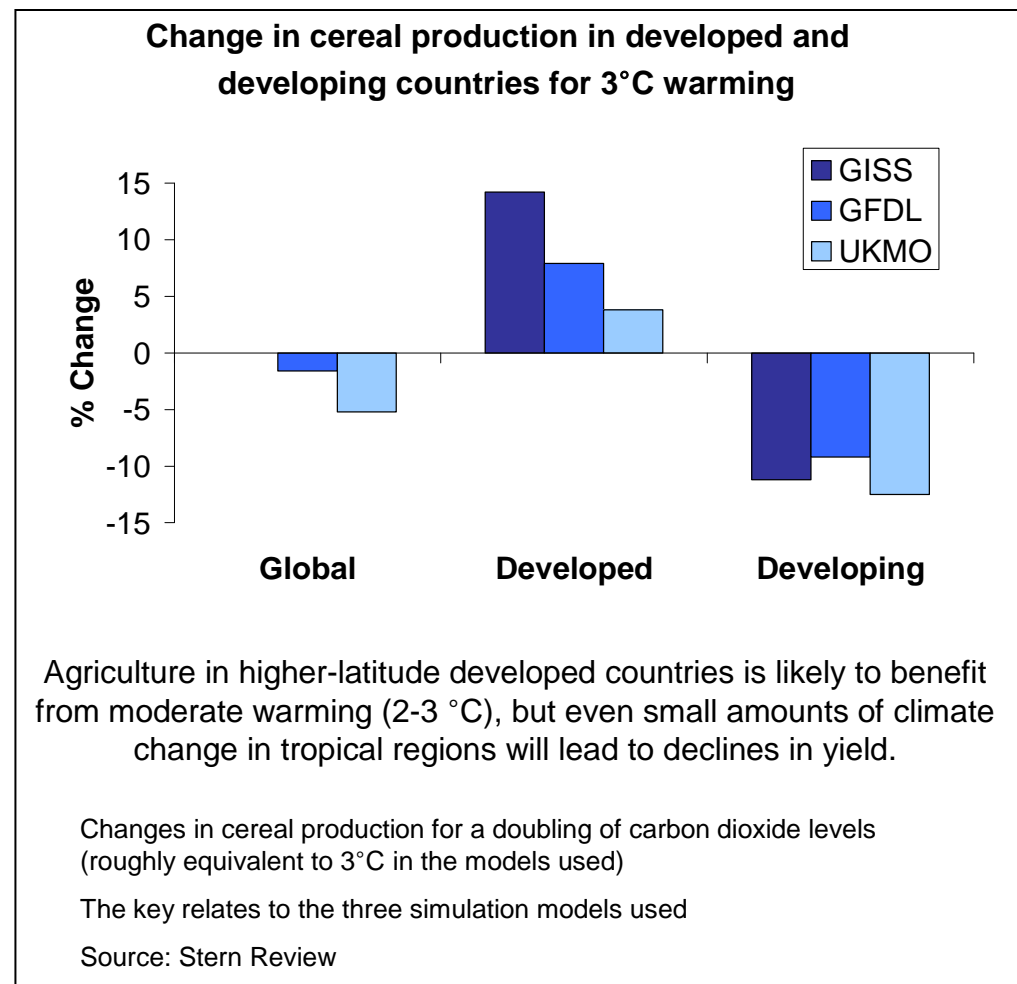
Stern Report findings

- Cost of unabated climate change:
 - equivalent to at least 5% of GDP each year
 - up to 20% of GDP or more if a wider range of impacts and risks are considered.
- Costs of mitigation to reduce greenhouse gas emissions
 - 1% of global GDP each year.
- Some costs of adaptation:
 - The incremental costs of adapting infrastructure to a higher-risk future could be \$15 – 150 billion each year (0.05 – 0.5% of GDP), with one-third of the costs borne by the US and one-fifth in Japan.

Evidence shows that impacts will be unevenly distributed: the poorest countries and people will suffer the most

- The impacts of climate change will not be evenly distributed: the poorest will suffer earliest and most.
- Developing countries are particularly vulnerable because they are already warmer, they are dependant on agriculture, and their low incomes makes it difficult for them to adapt.

The separate science summary paper has been produced for information purposes only, to facilitate a common understanding on the science of climate change.

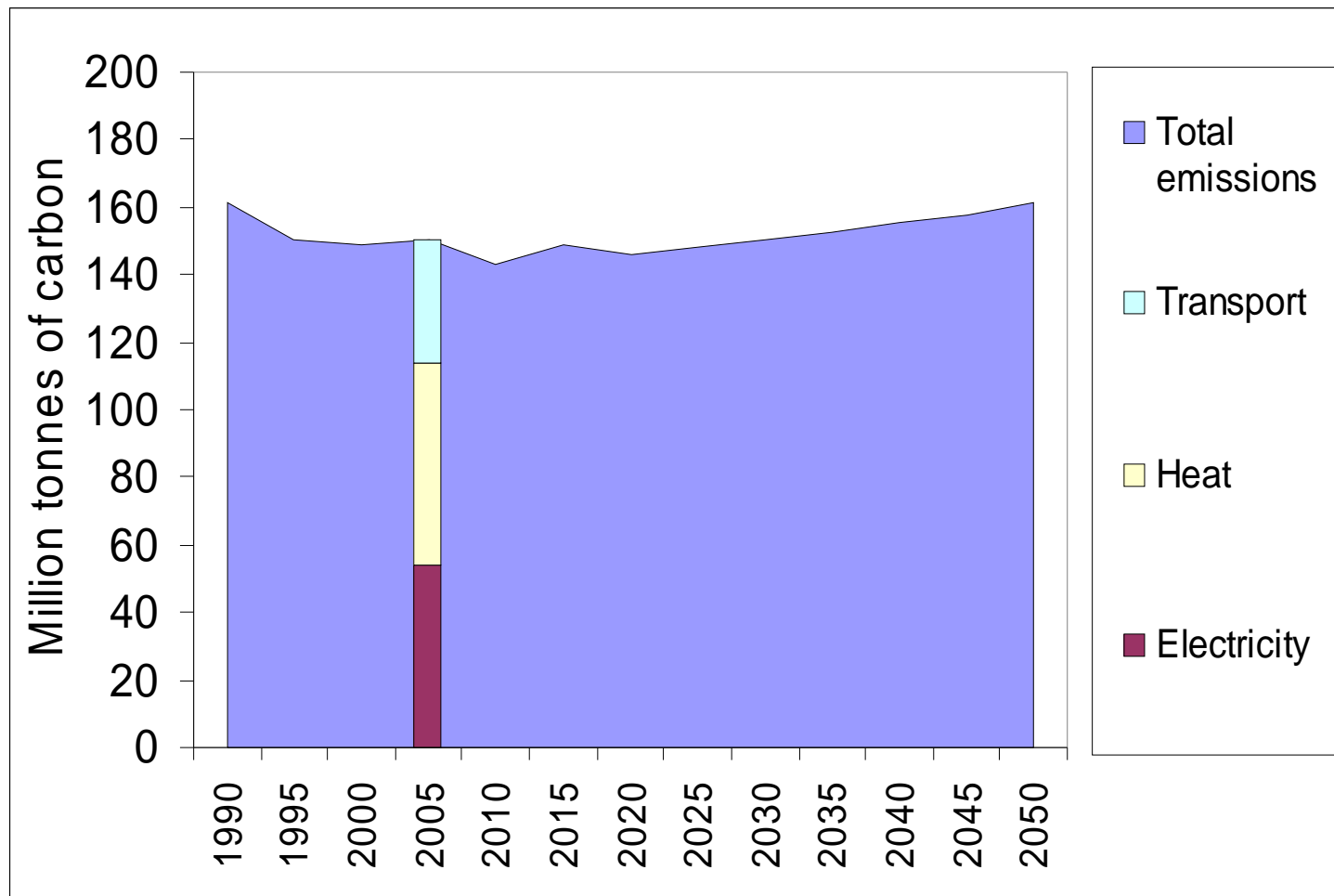


UK Energy Review conclusions

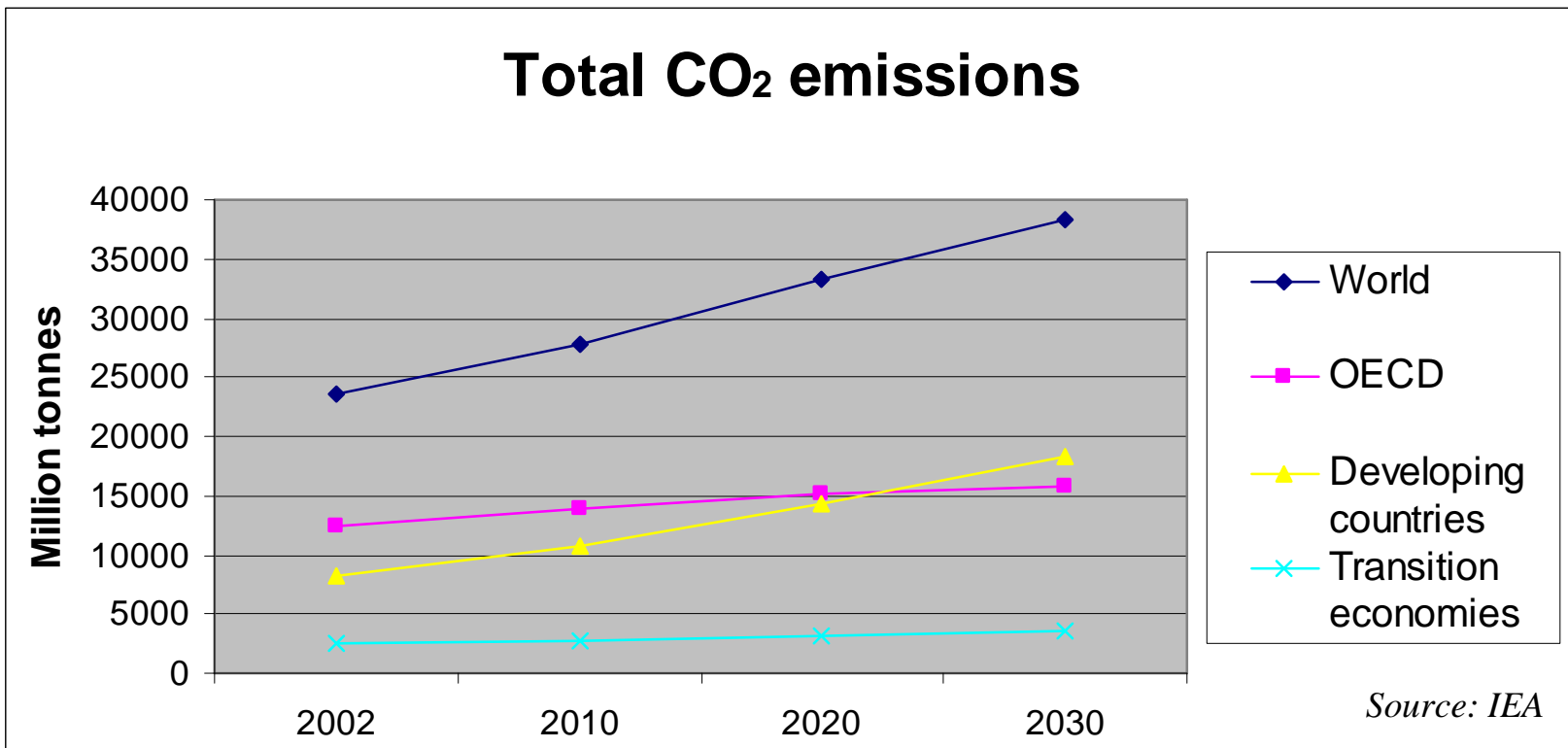
The UK Energy Review identified two key long-term challenges:

- Tackling carbon emissions
- Delivering secure clean energy at affordable prices, as energy import dependency grows, gas use grows and investment needs increase
 - By 2020 up to 90% of gas demand will be supply by imports.
 - By 2020 proportion of gas-fired generating capacity around 55%
 - Over next 2 decades, we will need around 25GW of new generating capacity (about 1/3 of today's total).

UK Carbon emissions will continue to rise unless further action is taken

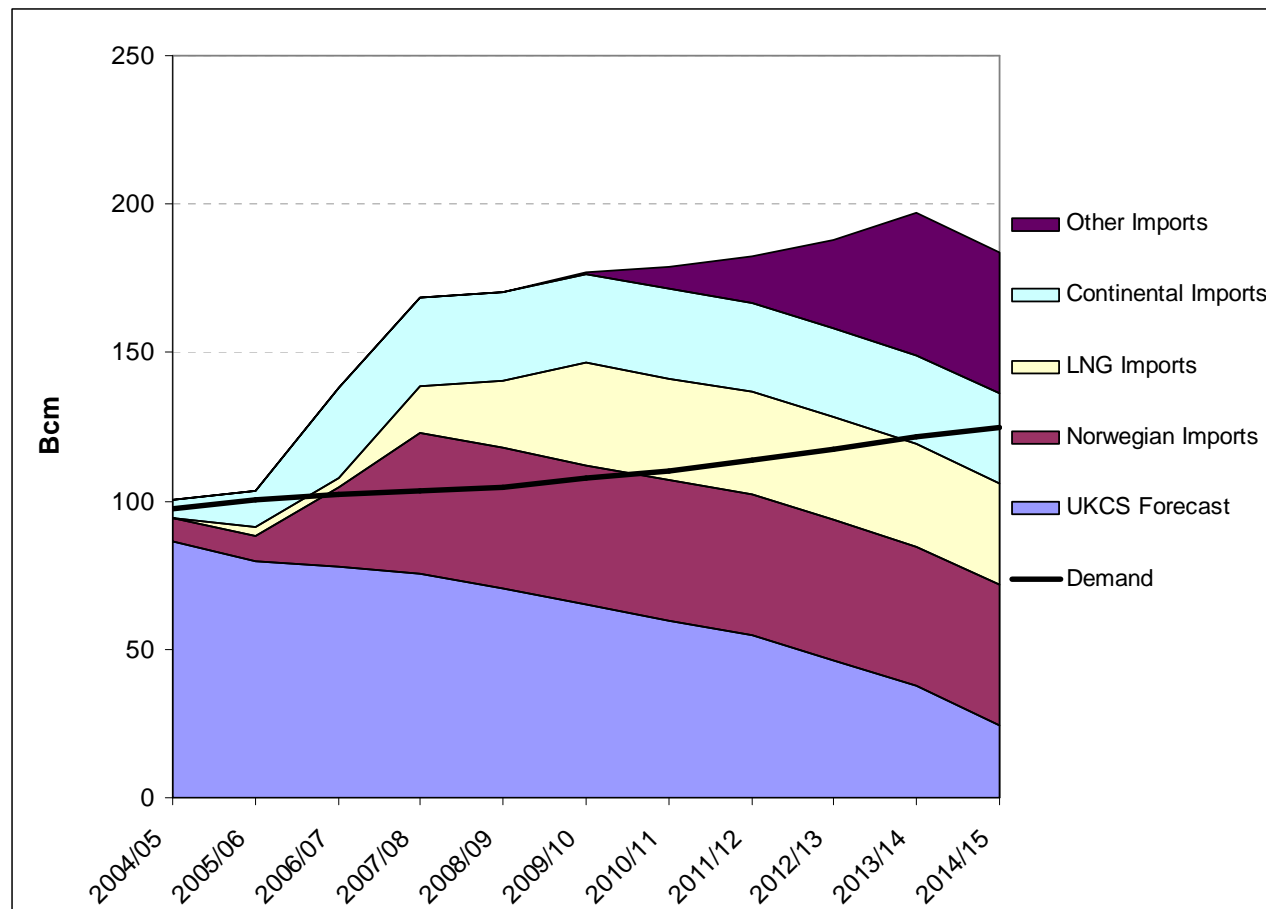


Global carbon emissions will grow also.



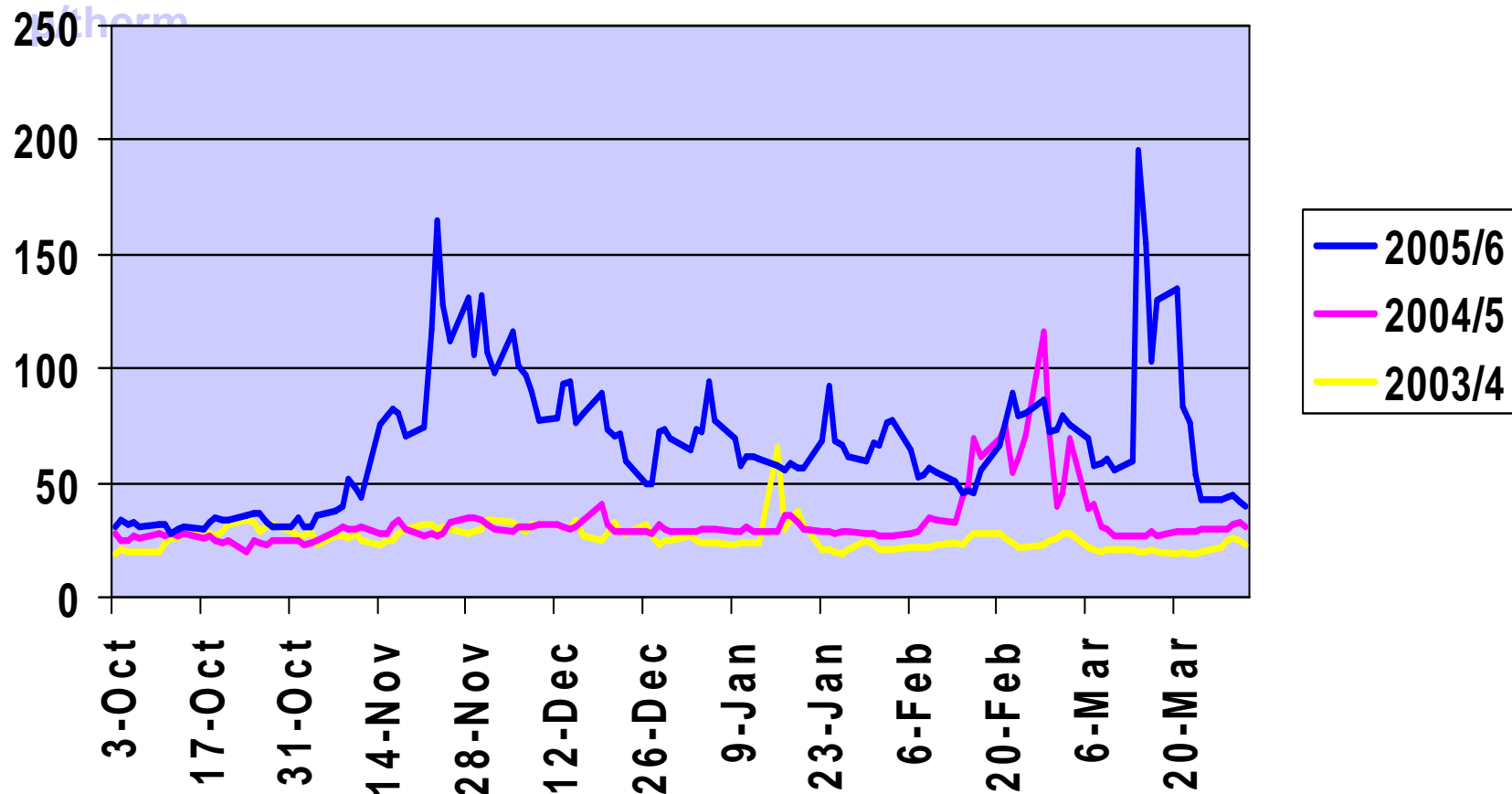
UK facing growing import dependence:

Gas supply and demand



And price volatility in the UK wholesale gas market has already increased in recent winters

Daily UK day-ahead* gas prices in winter 2003/4, 2004/5 and 2005/6



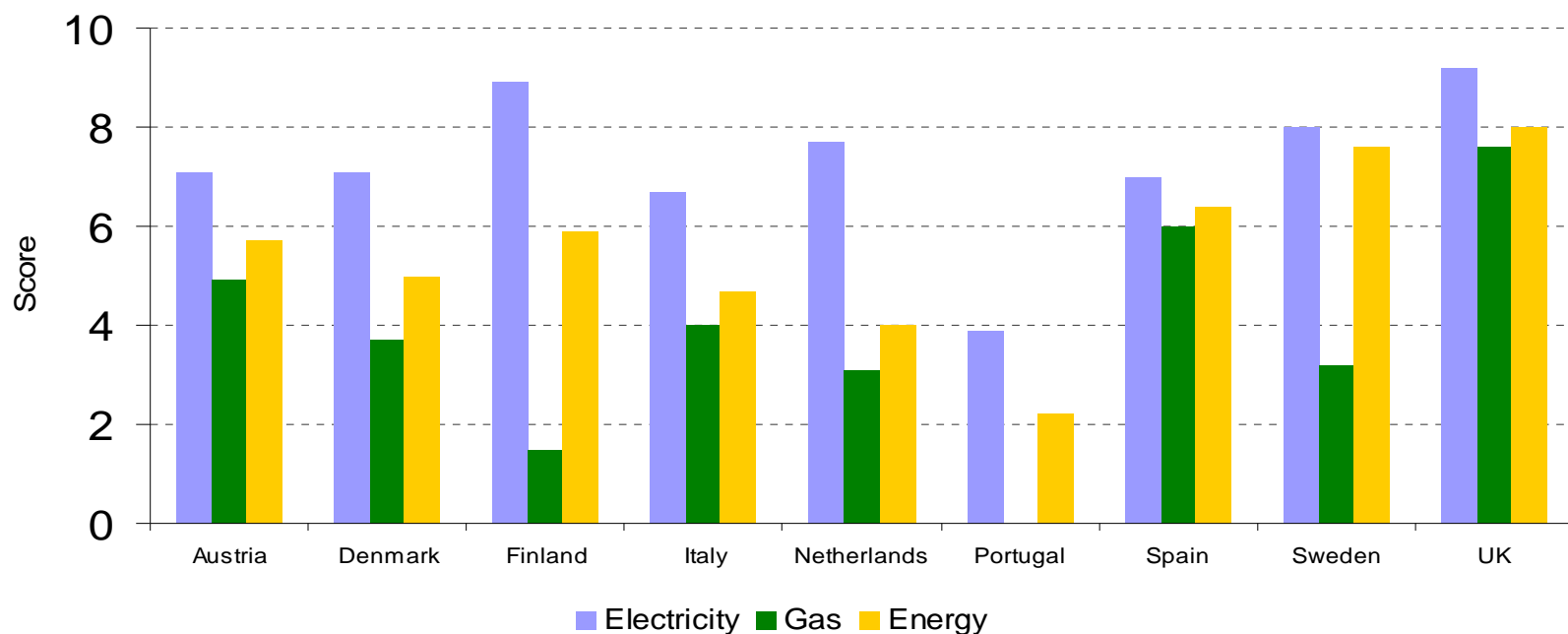
*Data excludes weekends; weekdays for 2003/4 and 2004/5 matched to corresponding dates in 2005/6

Source: Heren; DTI analysis

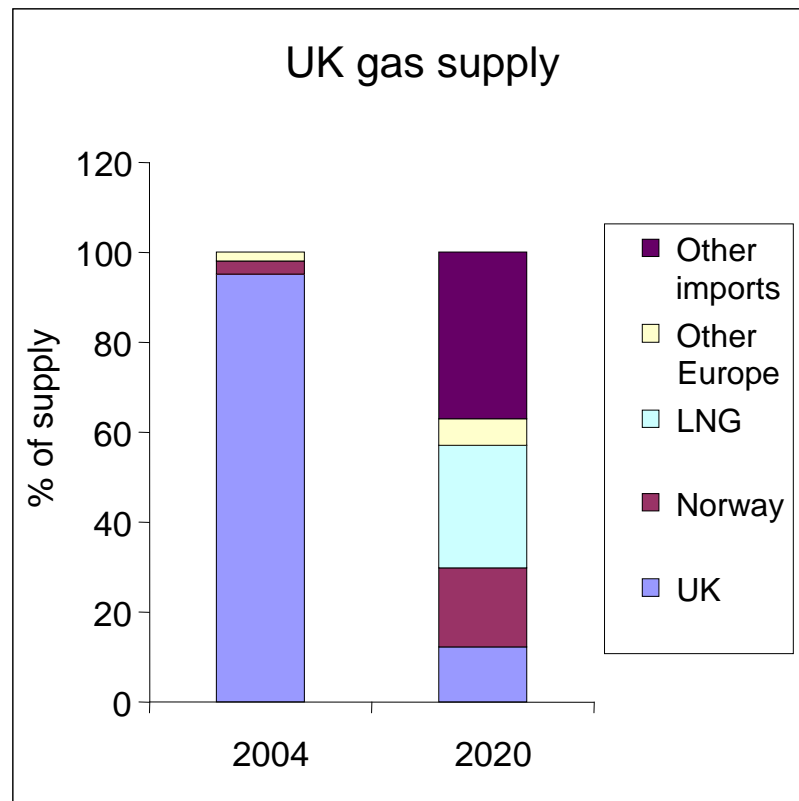
EU Liberalisation remains a key UK policy objective

And there is a lot to be done to liberalise markets, especially for gas

Competitiveness - overall competitiveness score for selected EU energy markets (using preliminary 2004 data)



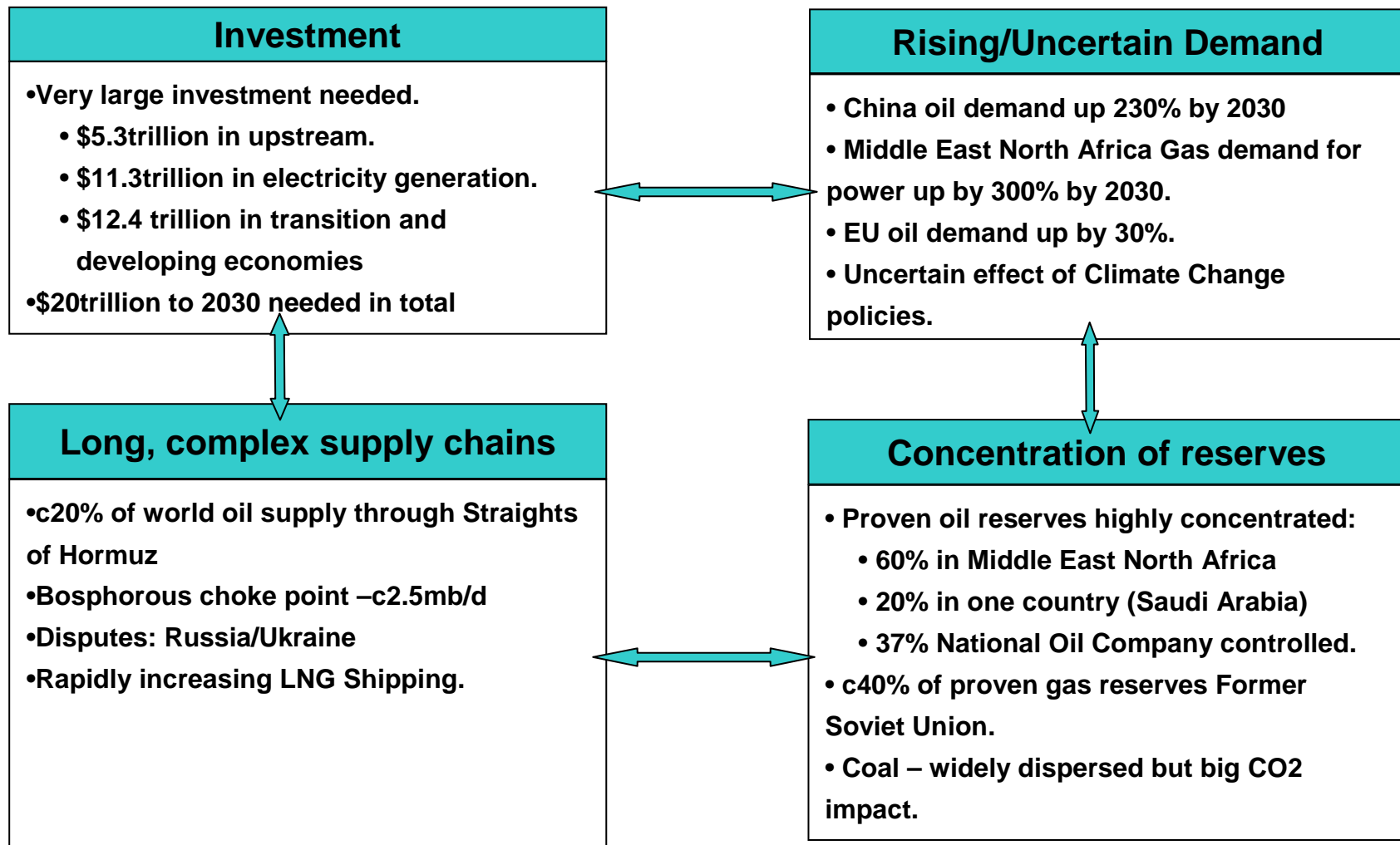
Security of supply – the UK must manage the risks from increased import dependence



Risks:

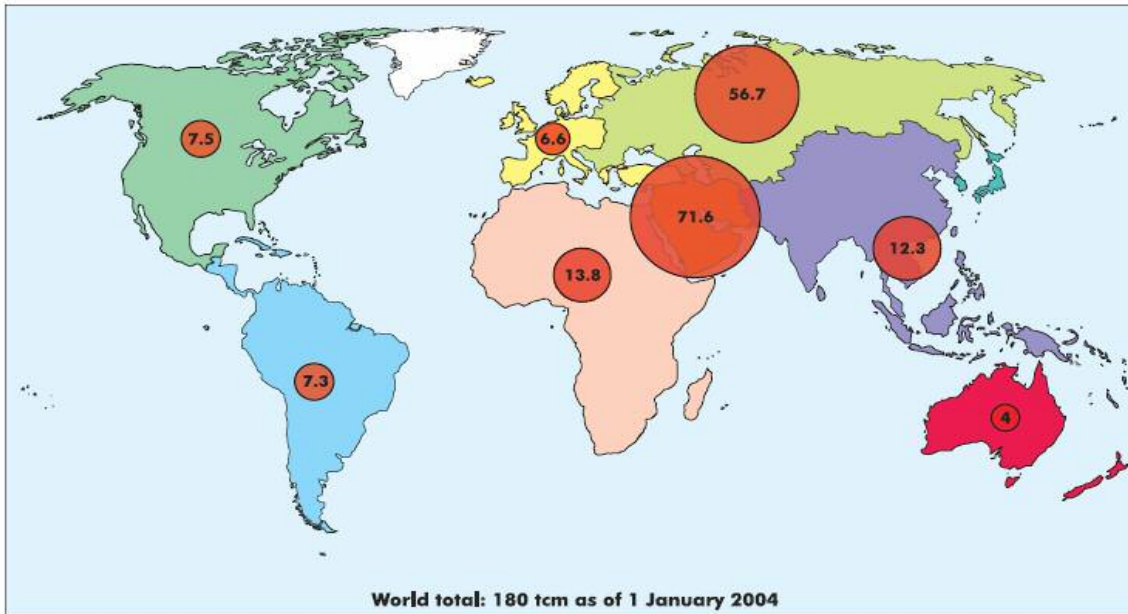
- Insufficient investment
- Long supply chains
- Political/regional instability
- Ineffective markets
- Resource competition
- Growing, uncertain demand.

Security of supply – complex inter-relationships



Gas Security of Supply

Figure 4.4: World Proven Reserves of Natural Gas



Source: Cedigaz (2004).

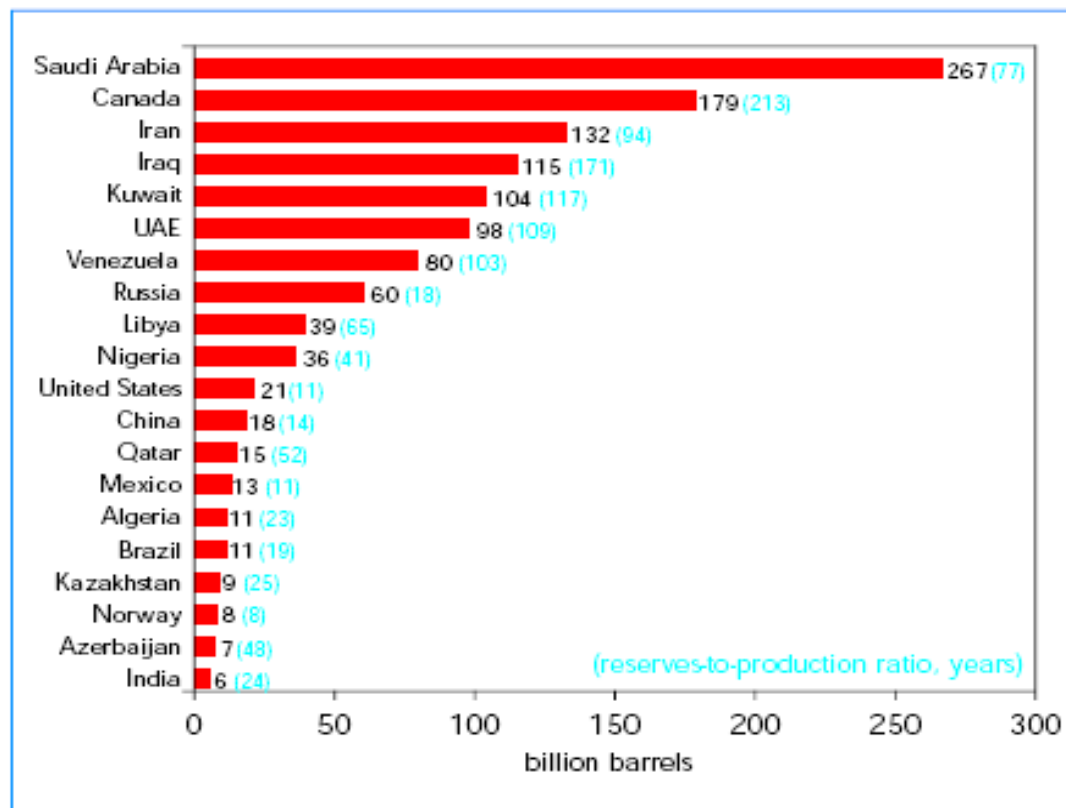
- Over 70% of proven global reserves in just two regions: FSU and Middle East. No other region with more than 7%.
- Concentrated reserves and pipeline infrastructure give rise to market power.

Headlines

- \$2.18 trillion needed upstream.
- \$1.4 trillion needed in transmission and distribution.
- 60% of Gazprom pipeline over 20 years old.
- Gazprom infrastructure – instrument of regional control.
- Political instability: Iran has 34% of reserves.
- Growing MENA own use: –desalination
- Deferred investment: preserve value for future generations.

Oil Security of Supply

Figure 3.2: Top Twenty Countries' Proven Oil Reserves, end-2005



Note: Canada includes proven non-conventional reserves.

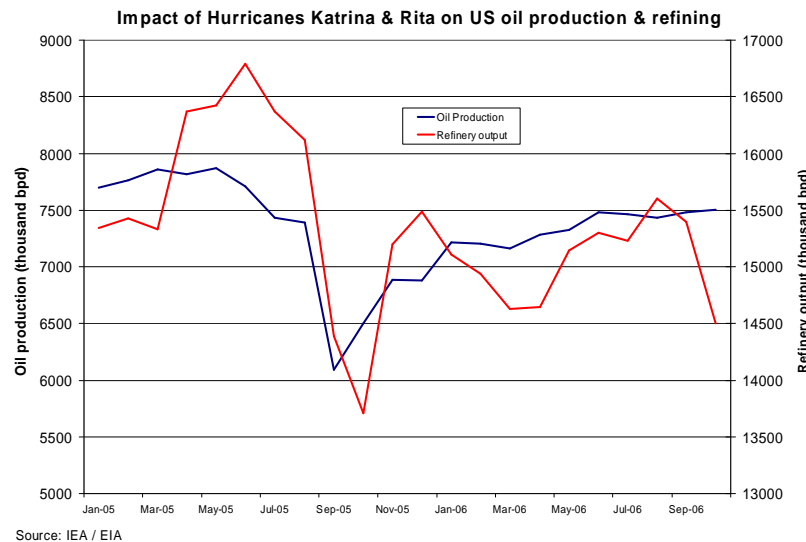
Source: *Oil and Gas Journal* (19 December 2005).

Headlines

- OPEC's share of supply will grow to 48% by 2030.
- Political instability: Iran and Iraq have 20%.
- \$3 trillion investment needed in exploration.
- Cost inflation: drilling rig rates up by 400% in Gulf of Mexico since 2002.
- Human capital constraints and mismatches.

Climate change – implications for energy security

- Extreme Weather Events:
 - Climate change is likely to intensifying the water cycle, so that severe floods, droughts and storms occur more often (The Stern Report).
 - Hurricanes Katrina and Rita:



The macro-economic Hurricanes Katrina and Rita

- ...\$90 billion in damage occurred to private-sector structures and equipment—homes, office buildings, drilling rigs, manufacturing equipment, motor vehicles, and household durable goods.
- ...Damage to local state capital stock and federal governments possibly another \$20 billion.
- Last year's hurricanes curtailed national GDP growth not only through direct losses in production in the affected areas but also through the impact of higher energy prices.

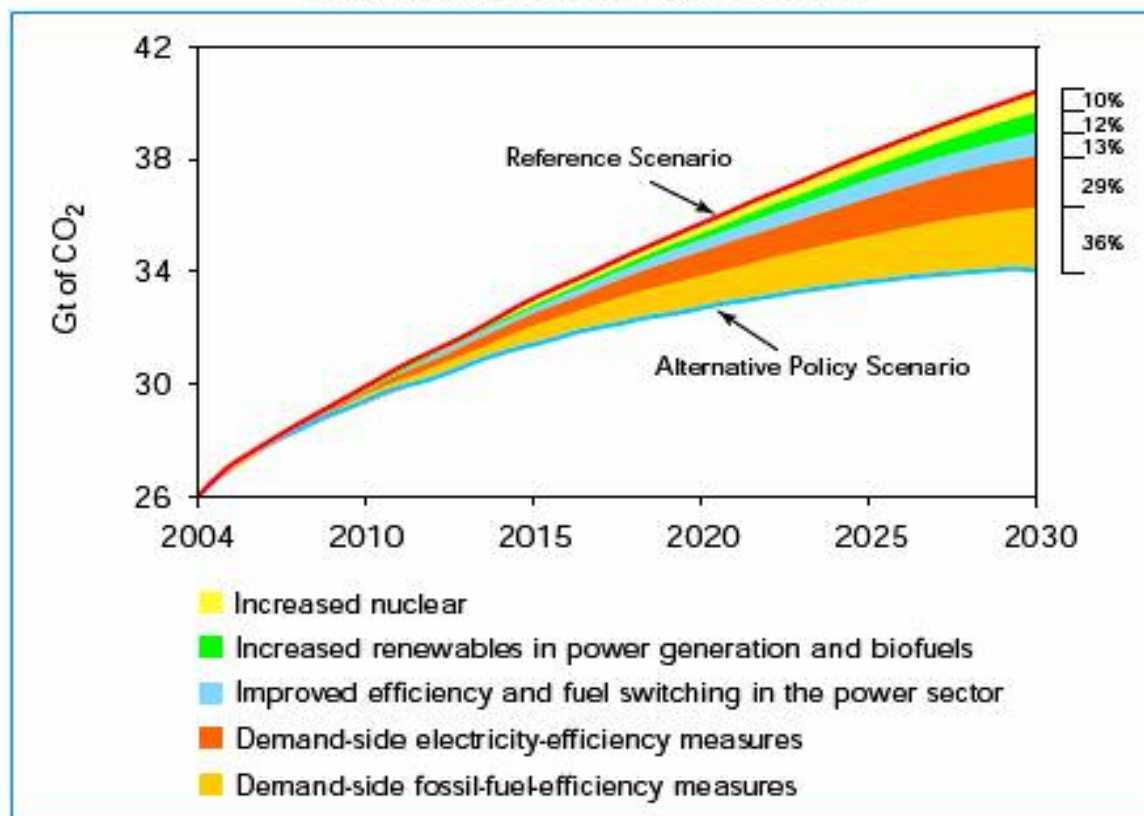
Congressional Budget Office, Report 2006

Climate Change – who pays?

- Extreme Weather Events:
 - Climate change is likely to intensify the water cycle, so that severe floods, droughts and storms occur more often (The Stern Report)
- Flood damage:
 - The cost of UK flood damage could increase 15x by 2080 to \$40bn/pa(US\$, 2004 prices)
 - European flood damage costs, could increase by \$120-\$150bn/pa.
- Storm damage (the most costly).
 - A 70-75% increase in insured wind-related losses from US extreme Hurricanes.
 - 67-70% increase in losses from Japanese Typhoons.
- Increase in insurers' capital requirements by 80-90% for Hurricanes and typhoons alone.

The IEA Alternative Policy Scenario

Figure 7.14: Global Savings in CO₂ Emissions in the Alternative Policy Scenario Compared with the Reference Scenario



Cost effectiveness of action now

- IEA Alternative Policy Scenario (APS): what can be achieved with current policies and technologies – No technological revolution:
 - By 2030, global primary energy demand is down by 10%
 - OECD oil imports stop growing by 2015 (for North America, a 10% cut in oil demand by 2030).
- The APS pays for itself:
 - Total investment to 2030 - \$560bn lower
 - Consumers spend \$2.4trillion more, suppliers \$3trillion less. This redistribution of investment presents a significant policy challenge.
- The APS provides:
 - Lower costs, greater energy security, lower carbon emissions.
- But it is not enough. CO2 emissions in 2030 still 8Gt higher than today.