Climate change – a business revolution?

How tackling climate change could create or destroy company value – oil and gas

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Bruce Duguid
April 2009

Climate change – a Business Revolution?

- The Carbon Trust
- Climate Change – a Business Revolution?
  - Oil E&P
  - Oil refineries
- Appendix
  - IEA slides
  - BP slides
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Our activities cover 5 low carbon business areas

Insights

Explains the opportunities surrounding climate change

Solutions

Delivers carbon reduction solutions

Enterprises

Creates low carbon businesses

Innovations

Develops low carbon technologies

Investments

Finances clean energy businesses

Accelerating the UK's transition to a low carbon economy

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Climate change – a business revolution?

Energy ….

1. Suppose the world DOES cut emissions sufficiently to stabilise global CO2 equivalent concentrations at 550ppm in 2050; via 4 different routes.
2. If so, when will oil and gas consumption begin to fall?
3. What will the impact be on an exploration and production company
4. What will the impact be on an oil refining company?

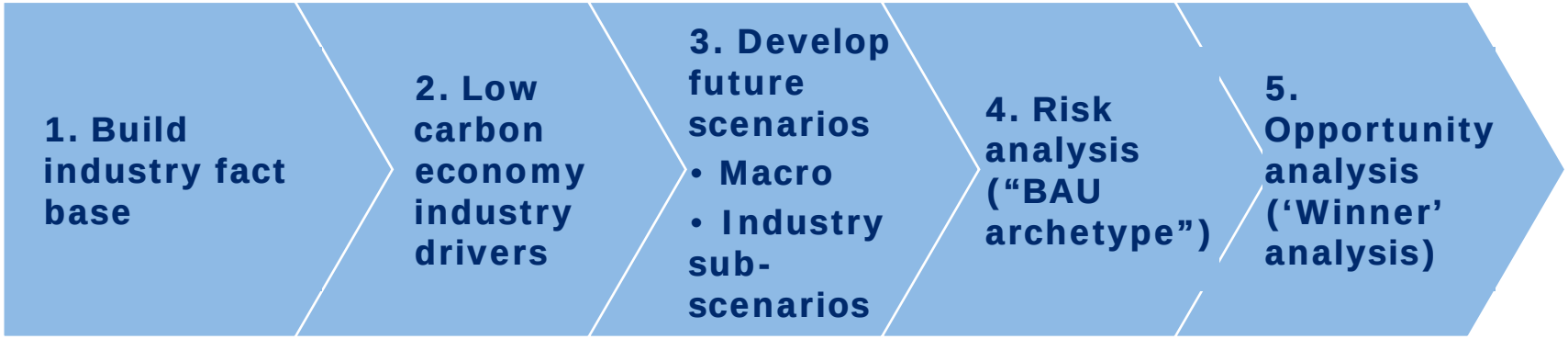
Our Approach

Global study, six sectors:

- Aluminium
- Automotive
- Beer
- Building Insulation
- Consumer Electronics
- Oil & Gas

Joint project team: Carbon Trust and McKinsey & Co. with scenarios from Oxera

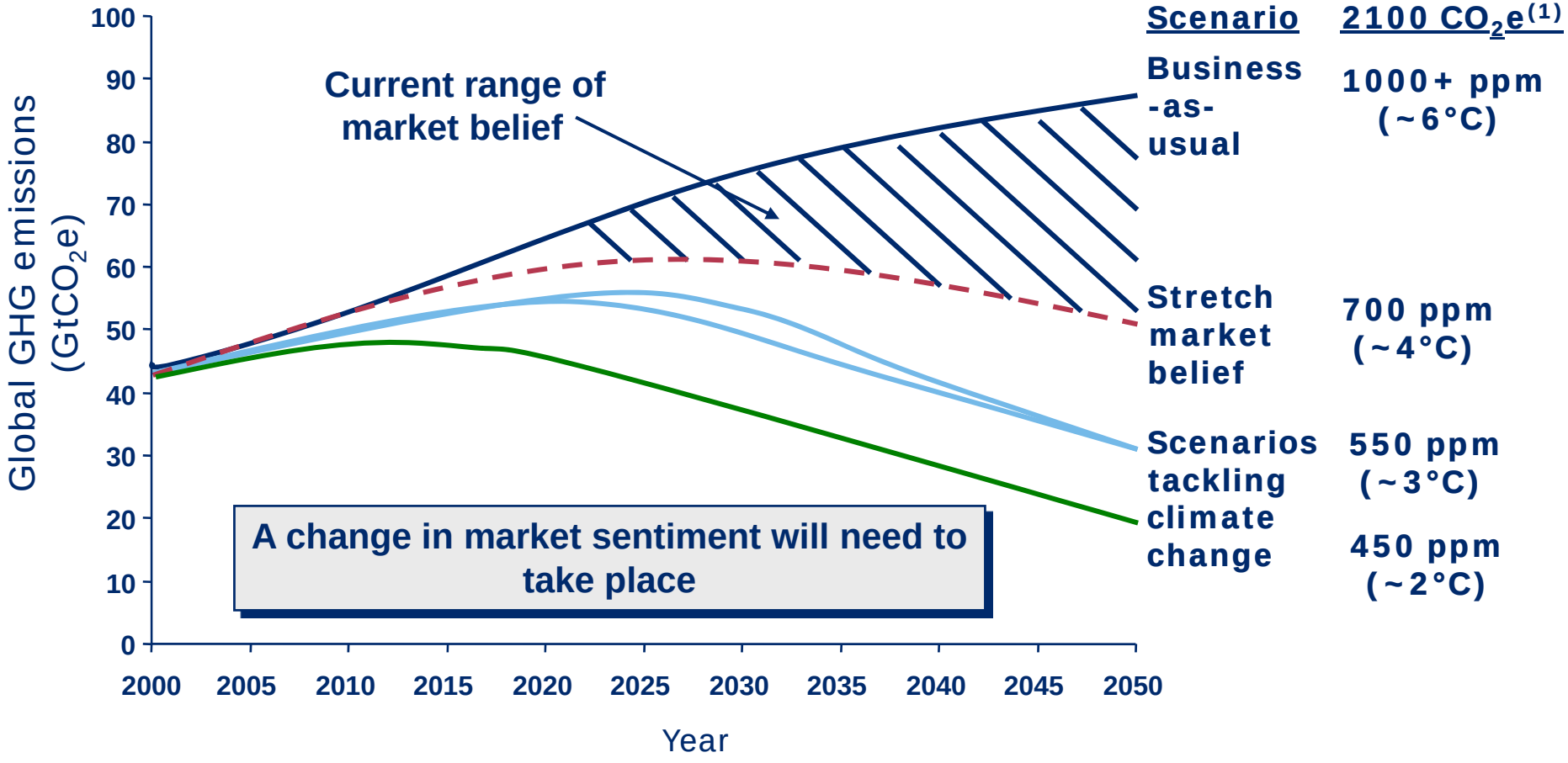
Then we analyse the cash flow impact on an archetypal firm, in each scenario



Risk and opportunity is measured via a discounted cash flow model

Global annual emissions in 2050 will need to be well below today's

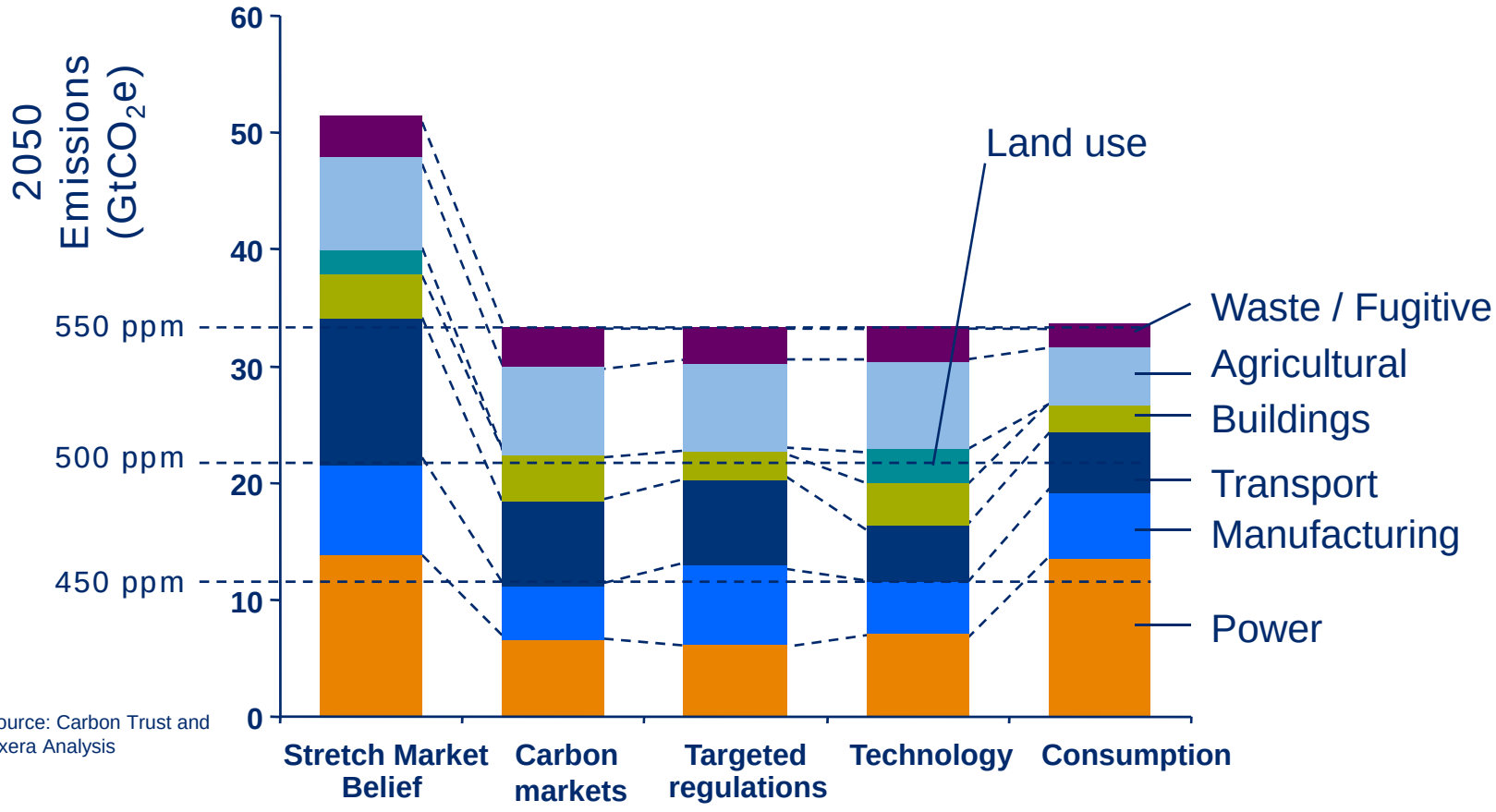
Global GHG emissions projections



Note: Equilibrium temperature projections using the median of the climate sensitivity ranges based on the IPCC TAR
Source: Oxera and Carbon Trust analysis

We model four 'success' scenarios, where different drivers motivate "success"

Variation in GHG emissions by source in 2050

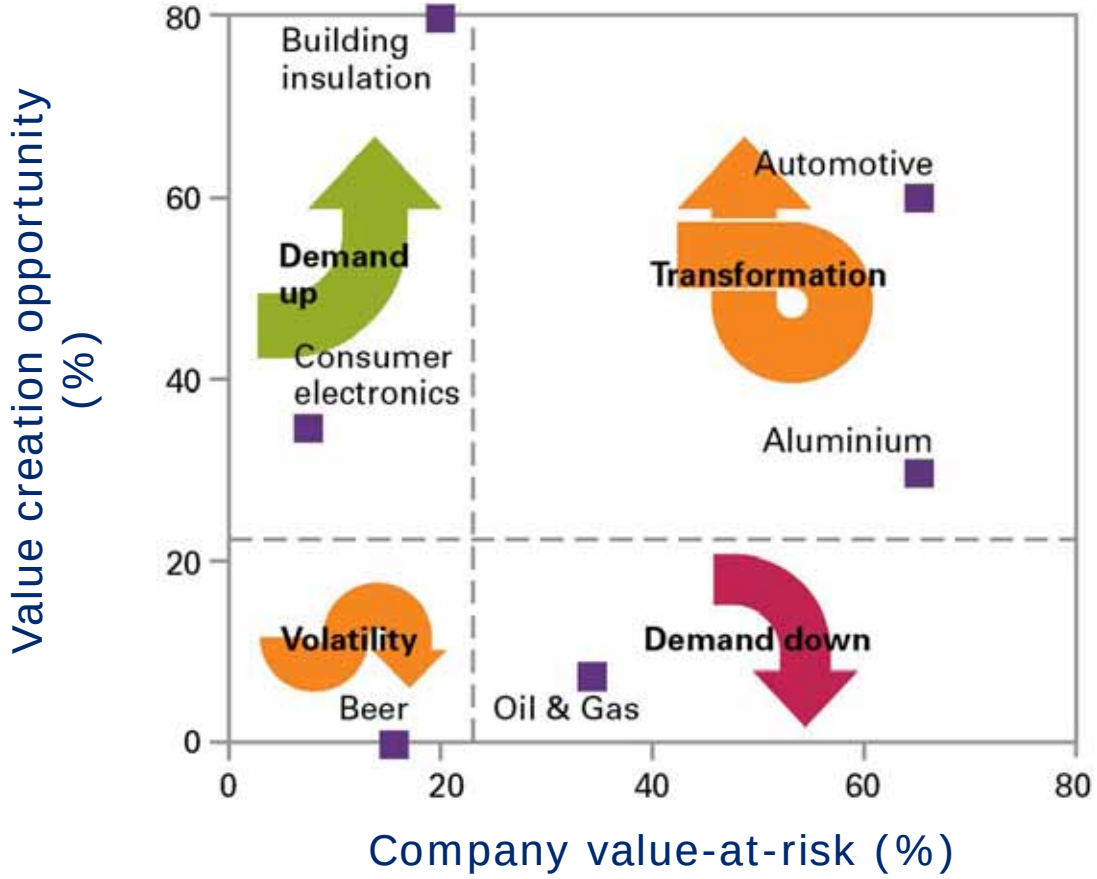


Source: Carbon Trust and Oxera Analysis

To achieve 450ppm, ALL industries would need to exploit ALL opportunities!

Different sectors have different levels of opportunity and risk

Calculated maximum value-creation opportunities and transition value-at-risk for companies



Source: Carbon Trust and McKinsey & Co. analysis

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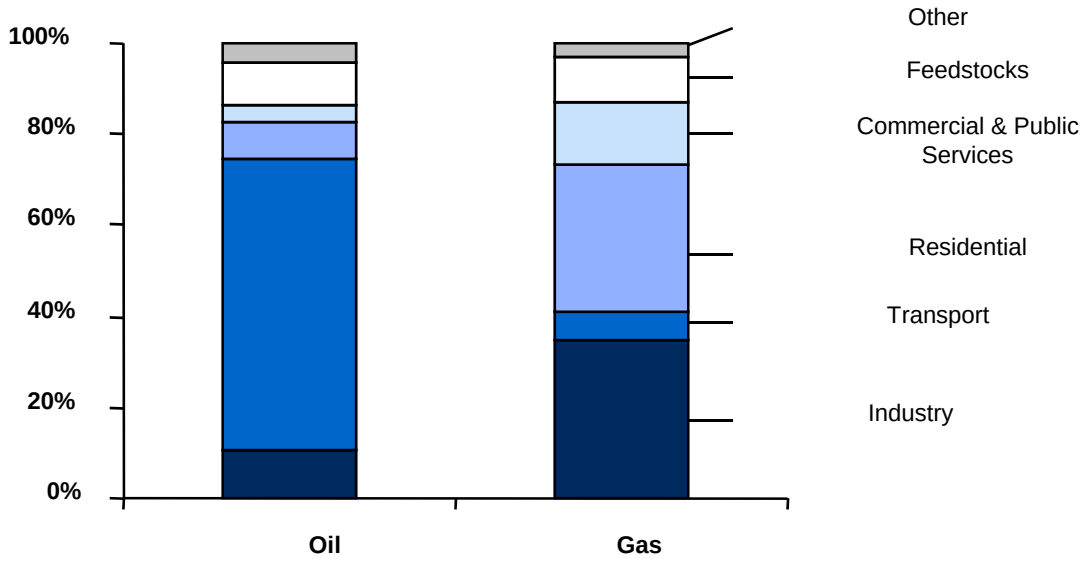
E&P companies – will face falling oil demand due to substitution and efficiency; and price falls

CARBON TRUST

- Oil consumption has growth at 2.2% CAGR between 1965 and 2007, gas at 3.6%
- We see oil and gas consumption peaking between 2020 and 2030
- Exploration & Production players must manage impact of reducing oil demand
- Top companies will correctly anticipate demand and achieve margin from low carbon intensity

Source: Carbon Trust and McKinsey & Co. analysis

Oil consumption largely would be driven by changes in the transport sector

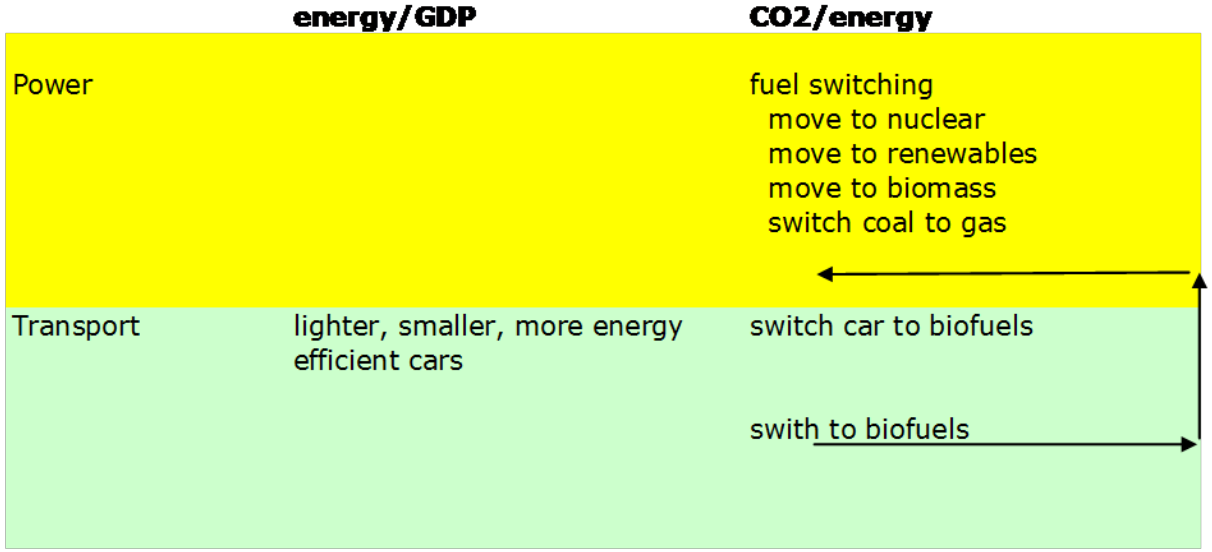


Source: International Energy Agency, 2005

Gas more driven by changes in industry and residential consumption

Fuel switching and more efficient cars would cut oil consumption

If GdP grows at set rate, we cut emissions via 1) energy efficiency 2) lower emissions per unit of energy use



CO2e emissions = GDP x energy intensity of GDP x carbon intensity of energy use

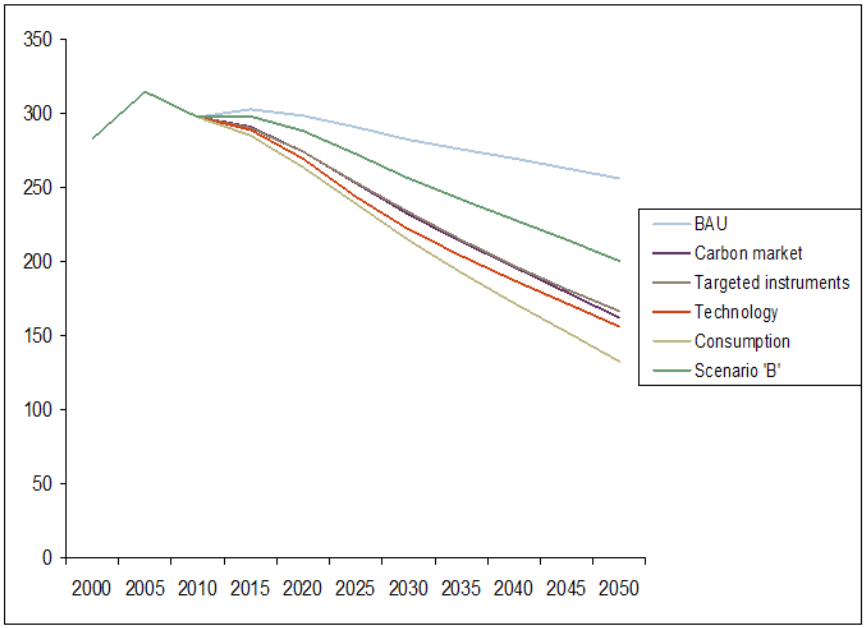
toe/GDP
unit of energy used/unit of GDP

tCO2e/toe
CO2e emissions/unit of energy used

Energy efficiency must rise, and emission per unit of fuel use must fall

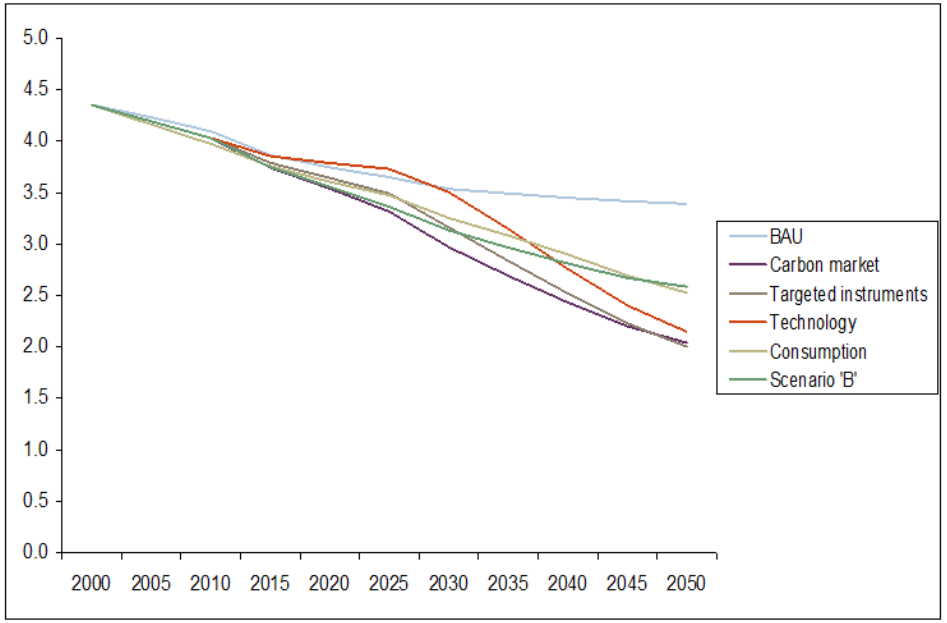
Energy and carbon intensity in the four "success" scenarios

Energy intensity of GDP



unit of energy used/unit of GDP

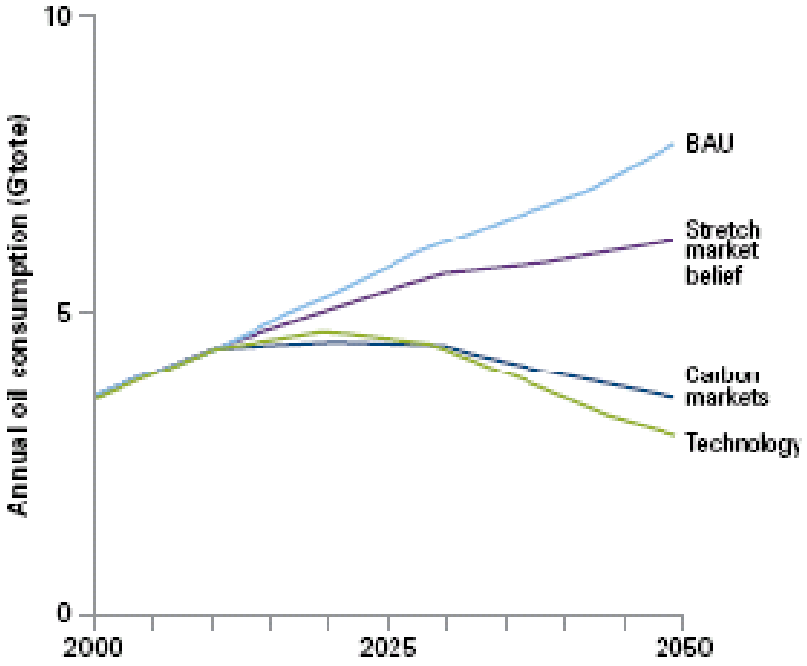
Carbon intensity of energy use



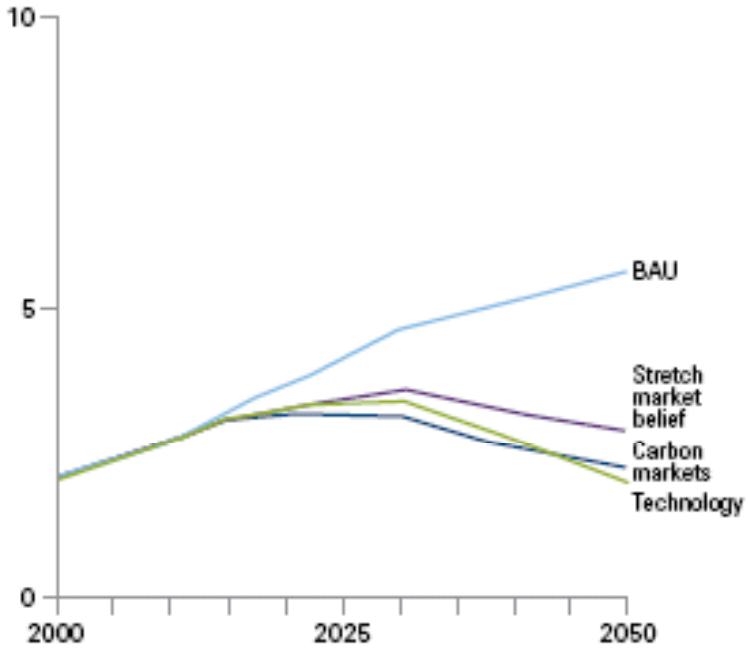
CO2e emissions/unit of energy used

Carbon efficiency and energy efficiency both improve in "business as usual". But progress is much more rapid in the four "success" scenarios

Oil consumption in the four scenarios



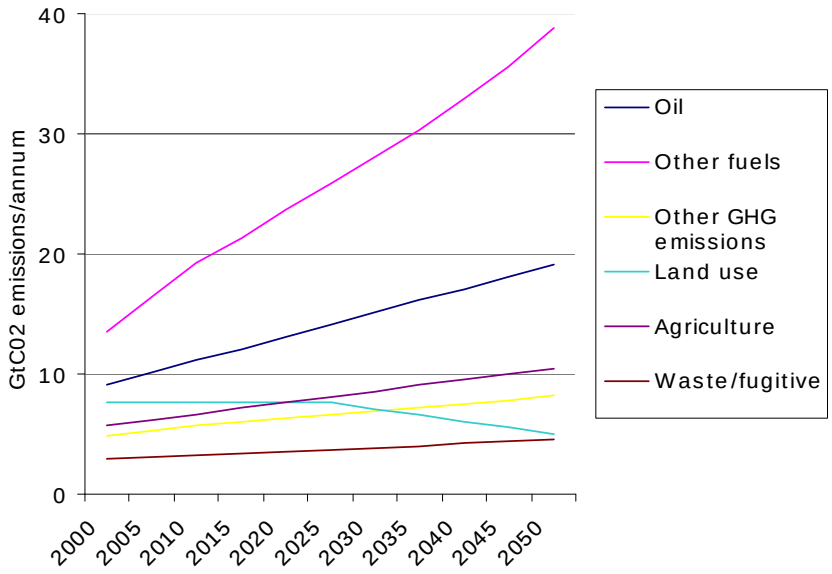
Gas consumption in the four scenarios



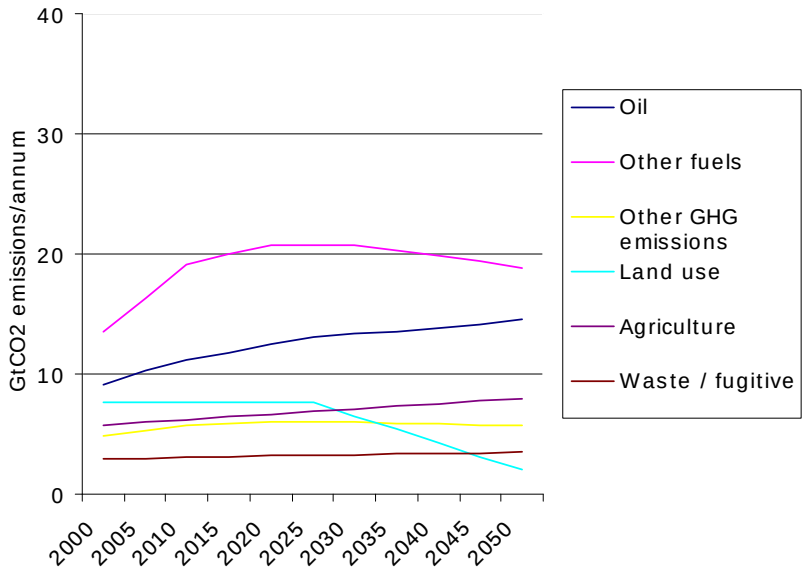
Oil consumption peaks between 2020 and 2025; gas between 2025 and 2030

CO2 emissions from oil consumption and other sources, to 2050: under "business as usual" and "stretch market belief"

"Business as usual" scenario



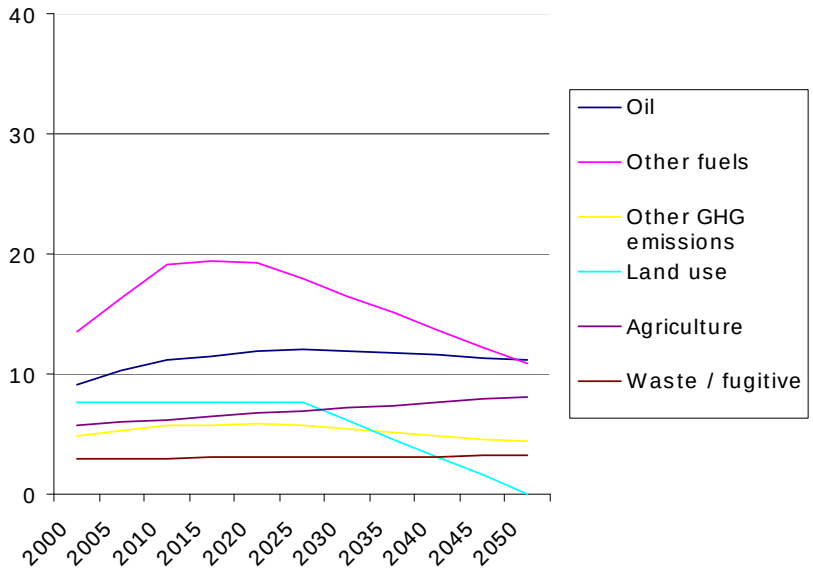
"Stretch market belief" scenario



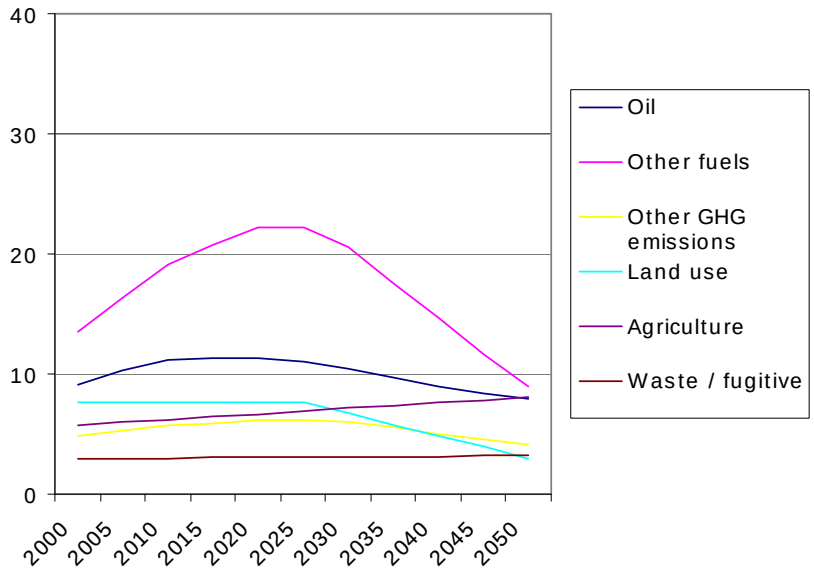
Giga tonnes of CO2 emissions by source, per annum, under two different scenarios

CO2 emissions from oil consumption and other sources, to 2050: under two "success" scenarios: "carbon markets" and "technology"

"Carbon markets" scenario

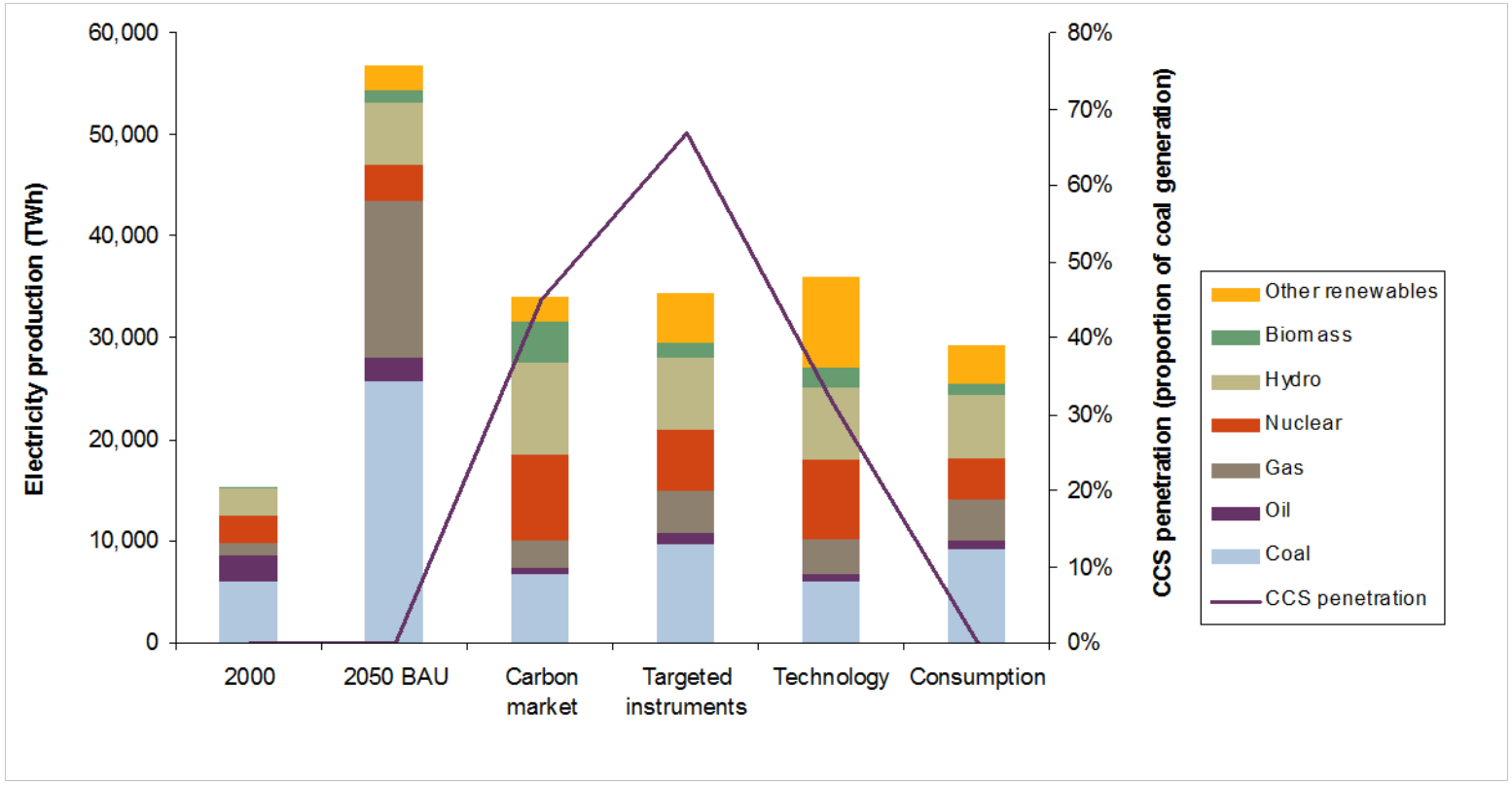


"Technology" scenario



Giga tonnes of CO2 emissions by source, per annum, under two different "success" scenarios

Fuel used in the power production, in the four success scenarios



Oil as a power sector fuel sharply in the four success scenarios vs 2000

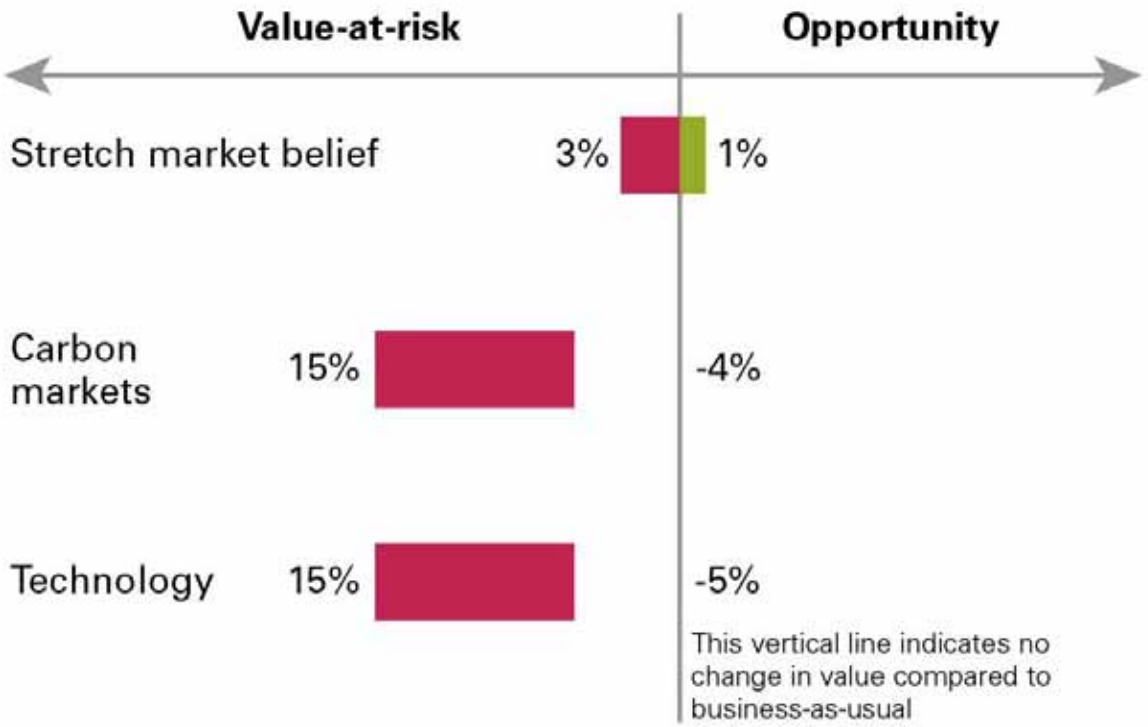
How vertically integrated players are impacted: fall in demand and price are "double whammy"

Scenario	Year demand for oil or gas falls	Peak reserves ratio	Assumed shift in oil & gas prices	Value-at-risk (excluding/ including price shift)	Low carbon opportunity (excluding/ including oil & gas price change)
BAU	Never falls	10:1	No change	na	na
Stretch market belief	Oil: Never falls Gas: Falls 2030 on	11:1	-25% from 2015	-2%/-10%	1%/-7%
Carbon markets	Oil: Falls 2020 on Gas: Falls 2025 on	13:1	-25% (2015) -50% (2030)	-13%/-30%	-3%/-20%
Technology	Oil: Falls 2020 on Gas: Falls 2030 on	12:1	-25% (2015) -50% (2020)	-11%/-29%	-4%/-21%

We assume a tax wedge is introduced, which prevents price to the consumer falling, but sees price achieved by the producer fall

Exploration & Production value opportunity and risk

Excluding oil price shifts

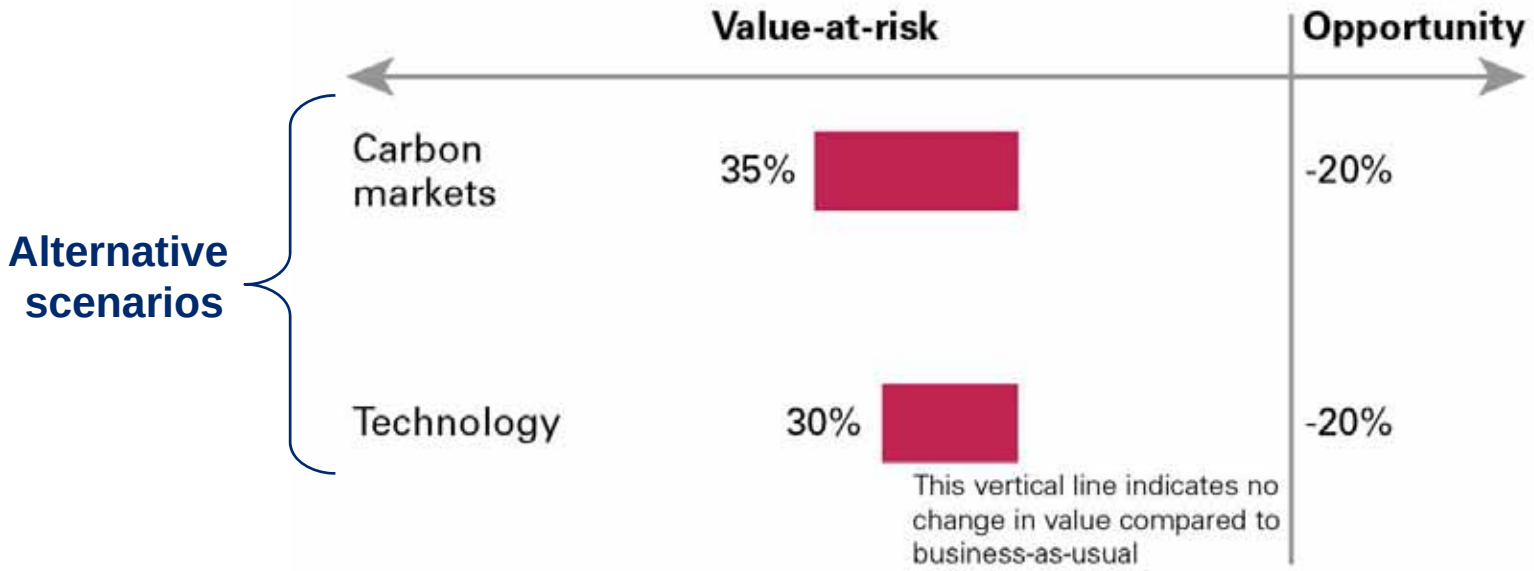


Alternative scenarios

Source: Carbon Trust and McKinsey & Co. analysis

Oil exploration & production value opportunity & risk

Including oil price shifts



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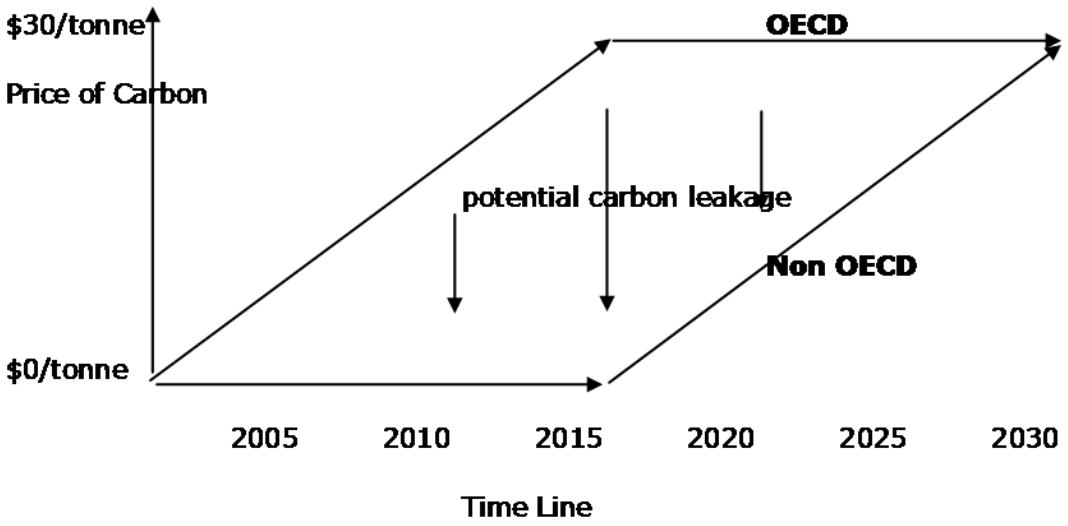
Carbon differential means potential carbon “leakage”:



OECD firms compete with non-OECD firms that do not internalise carbon costs

Oil refining and potential leakage

"auctioning of allowances would be premature until non-EU competitors face similar costs".....

"It would discourage investment in EU refineries and result in increased emissions in CO2 in areas such as the Middle East and Russia, increase EU imports of diesel and jet fuel, reduce EU exports of petrol, and reduce energy supply security".

Ian McPherson, UK PIA's Director of Environment, Health and Safety

Opponents of auction permitting for refineries, say it leads to leakage

Oil refining already in the EU-ETS. But won't be short permits until 2013

During phase 2 of the EU-ETS (1 Jan 2009 to 31 Dec 2012), EU oil refiners have been over supplied with emission permits.

But in the first year of phase 3 (1 Jan 2013 to 31 Dec 2020) 20% of all permits allocated to the oil refinery sector will be auctioned, with the remaining 80% being handed out (grandfathered) for free.

Auctioning should rise from 20% of permits in 2013 to 70% in 2020.

Companies might avoid the permit shortfall if they convince the EU Commission that they would suffer carbon leakage (i.e. industry would move overseas and no overall emission reduction would be achieved).

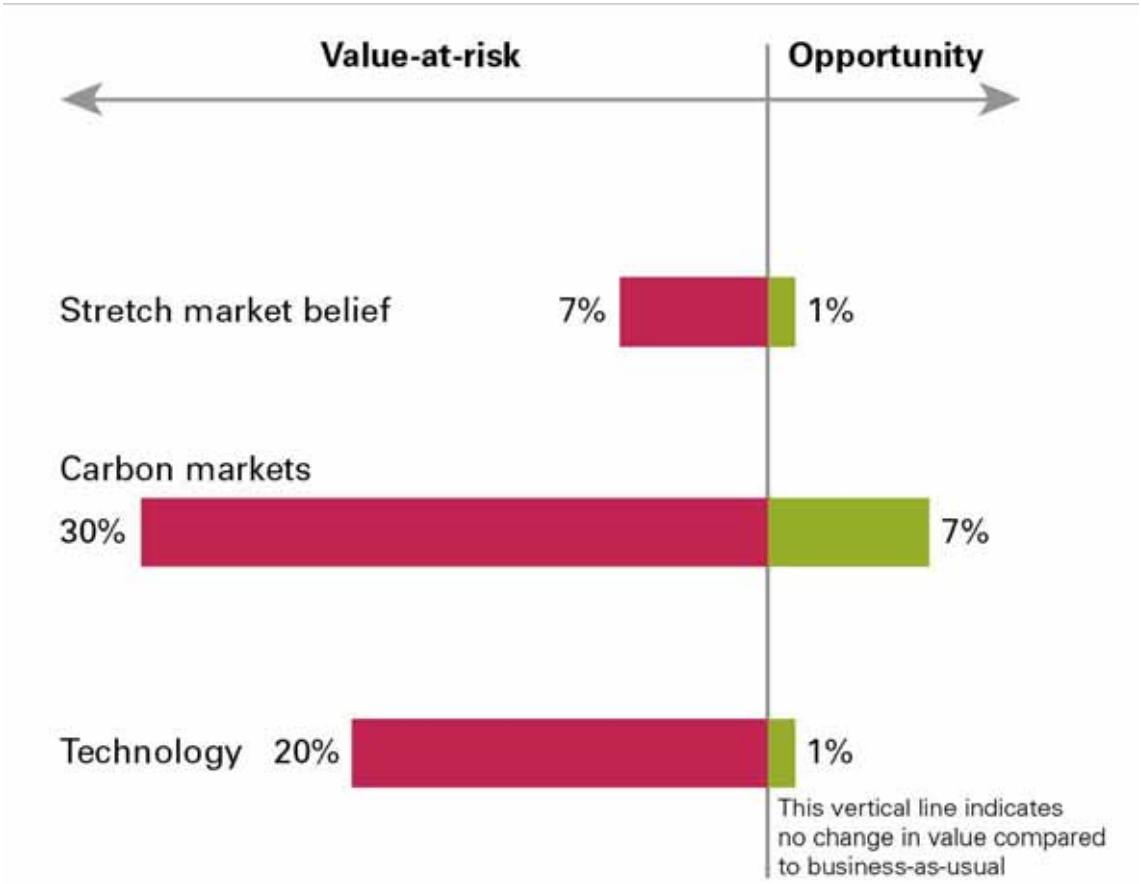
But even if companies "prove" carbon leakage, they would only be granted permits in relation to an industry benchmark. Less efficient companies than the bench mark would still need to buy permits.

Oil refiners to be permit buyers in phase 3 of the EU-ETS

How refinery companies are impacted

Scenario	Peak demand	$/tCO$_2$ 2030+	Year by which full carbon cost paid	Transition value-at-risk	Market share of opportunity	Value creation opportunity
BAU	> 2050	0	na	0%	2%	0%
Stretch market belief	> 2050	$25	OECD: 2015 RoW: 2030	5%	2%	0.5%
Carbon markets	> 2050	$100	OECD: 2015 RoW: 2030	20%	3%	4%
Technology	> 2050	$50	OECD: 2015 RoW: 2030	14%	4%	0.5%

Oil refining value opportunity and risk



Alternative scenarios

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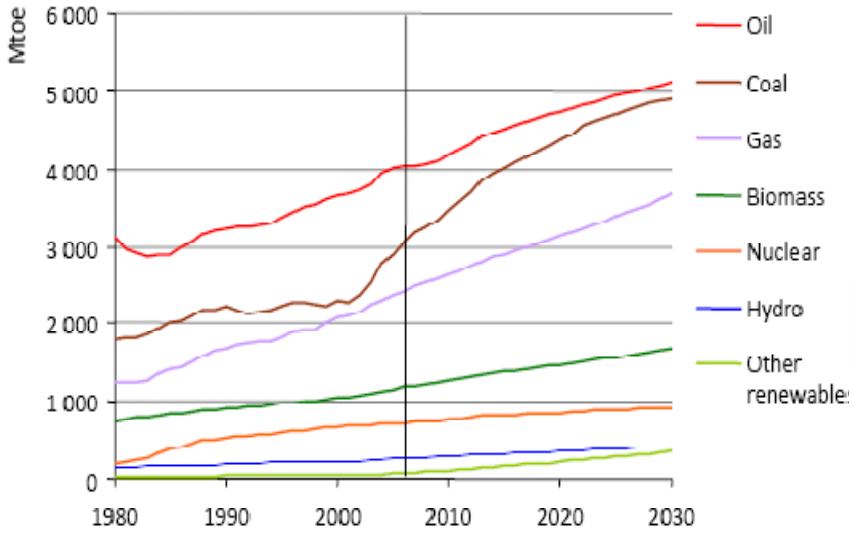
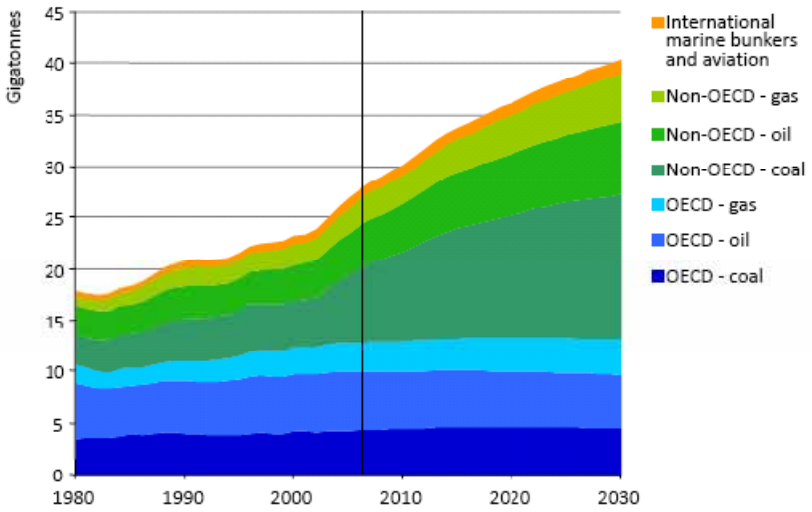
IEA business as usual scenario sees rapid rise in fuel use and energy sector emissions – especially from coal

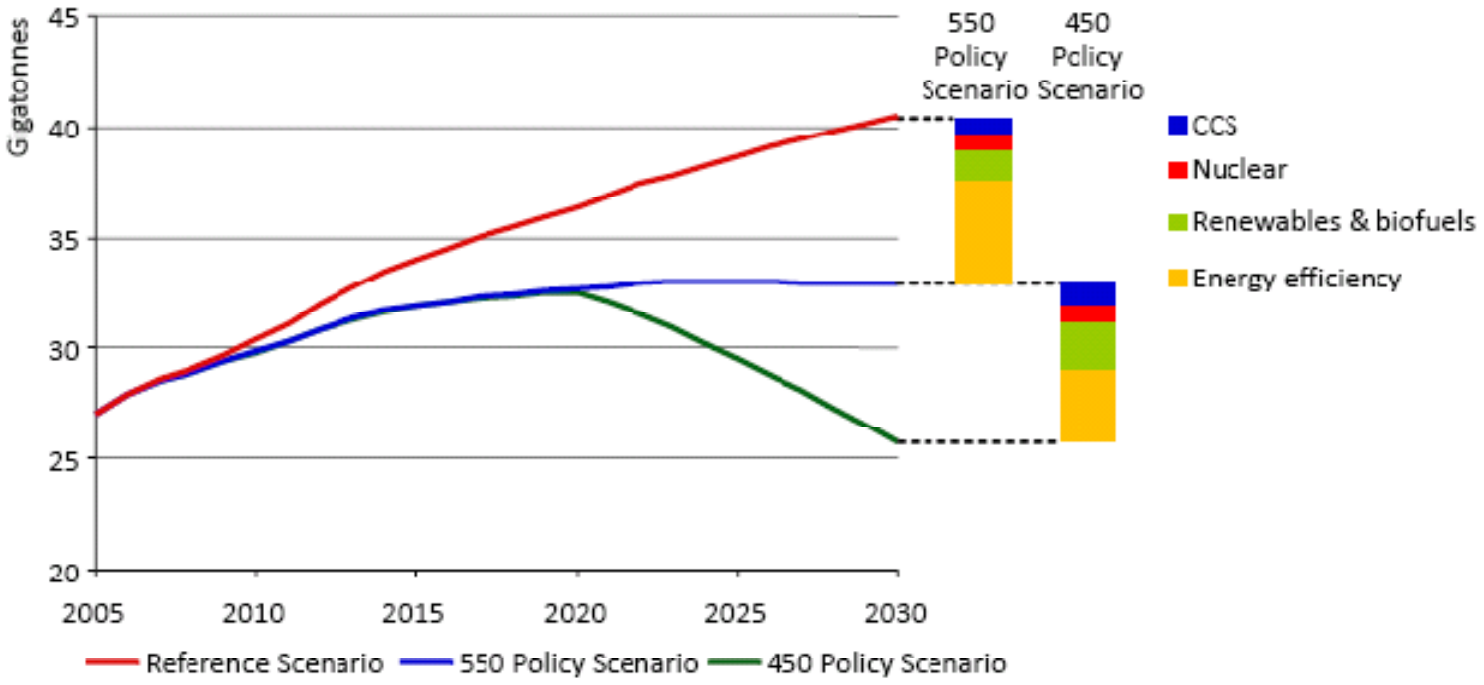
Primary energy consumption by fuel, under business as usual



Energy sector CO2 emissions, by fuel source



IEA energy sector emission reduction achieved by energy efficiency, renewables, biofuels, nuclear and CSS



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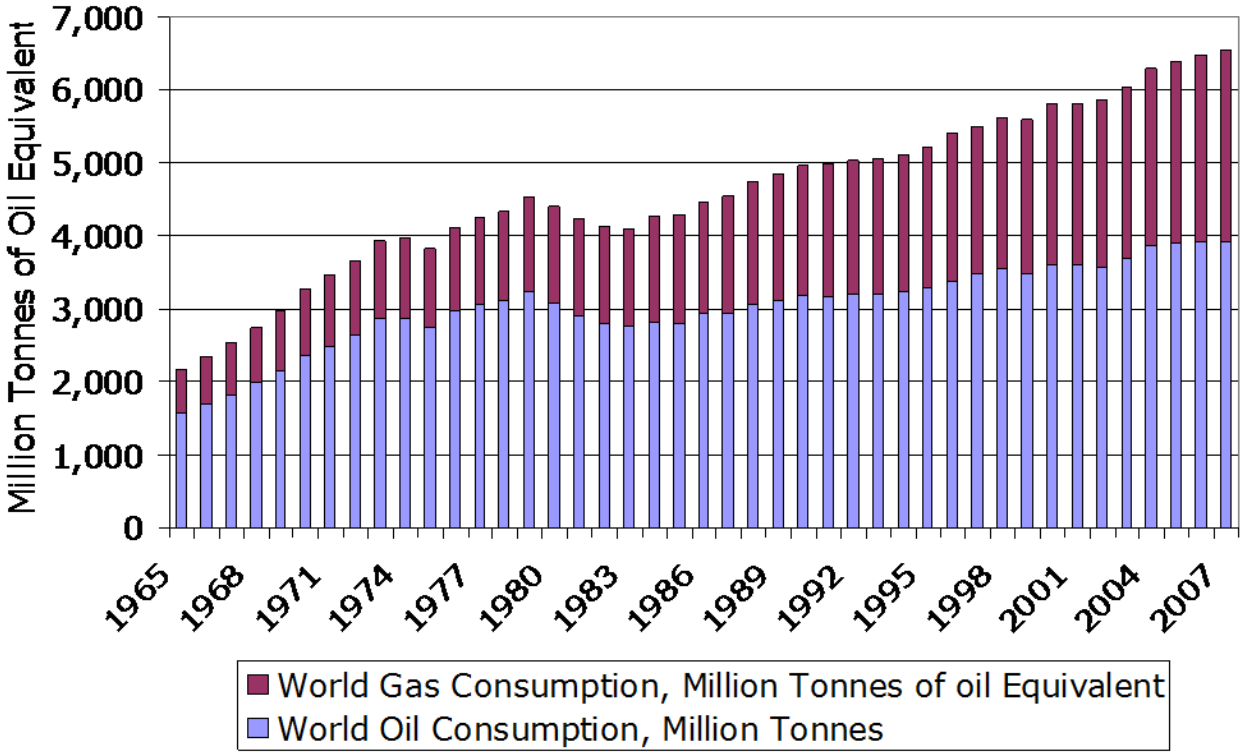
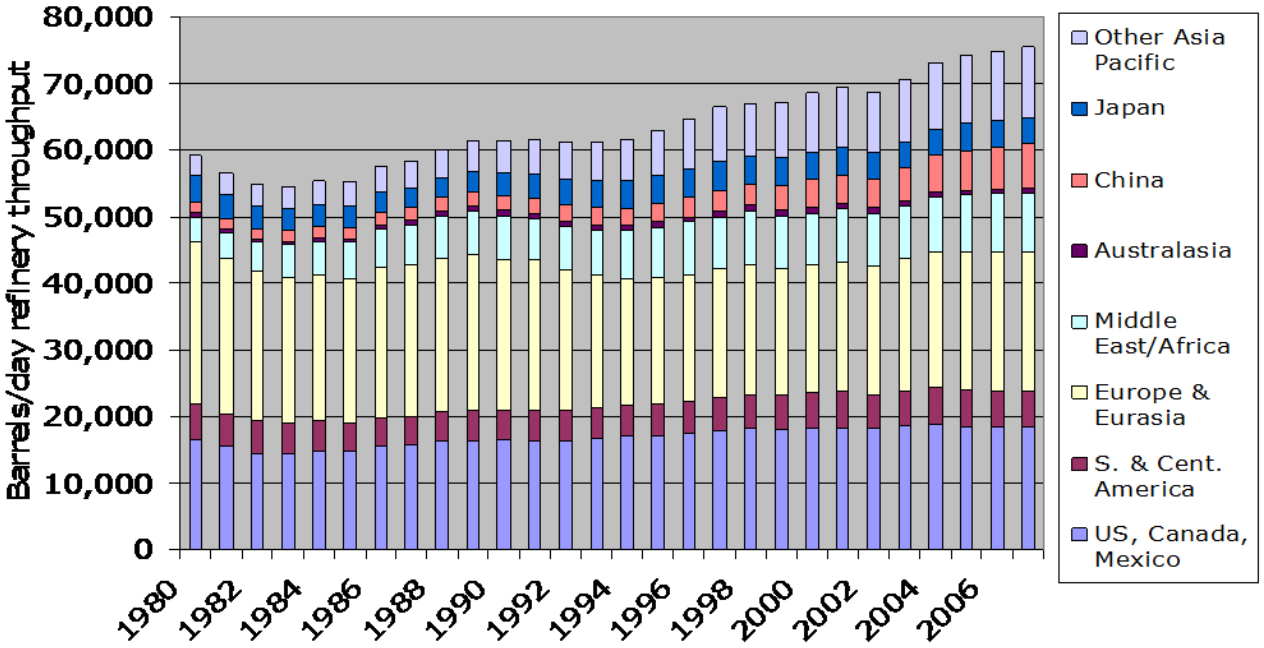
Global oil and gas consumption has grown at rapid pace – only dipped between 1979 and 1983



Oil consumption CAGR of 2.2%, gas CAGR of 3.6%, between 1965 and 2007

Refinery oil throughput growing rapidly in China, Japan, Asia Pacific



Rapid rise in refinery throughput in China and other Asia/Pacific

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Obama and US policy – takeaway from Obama's 2010 budget

"reduce GHG emissions approximately 14% below 2005 levels by 2020, and approximately 83% below 2005 levels by 2050"

US 2005 emissions were 7.2 GtC02e, so 2050 will be 1.2 GtCO2e. Compares to 50 GtCO2e in 2005 and must be 20 GtCO2e in 2050 to be on course to have chance of <2 degrees centigrade temp. rise

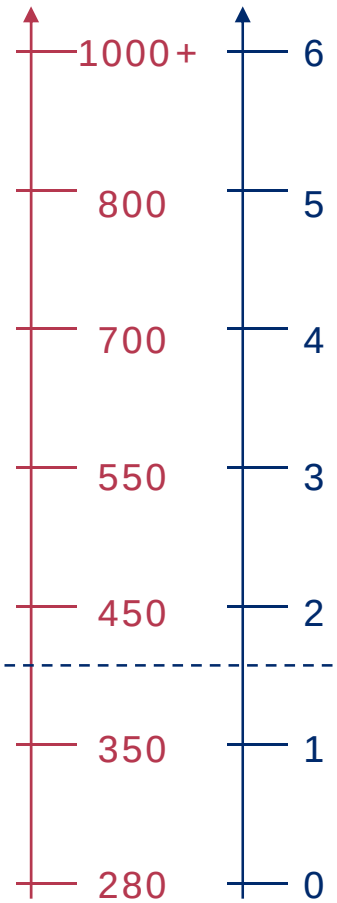
Means US would go to 2.7 tCO2e/capita from 24 tCO2e/capita.

Cap and trade system, with 100% auctioning, to begin in 2012.
$150 bn from the auctioning, will be spent over a yr 10 period

$79 bn could be raised from auctions in 2012, rising to $83 bn in 2019

Source: http://www.whitehouse.gov/omb/budget

Temperature is estimated to increase in range 1.1-6.4C by 2100



Environmental Change	Human Impact
➢ Abrupt, run-away change	➢ Mass loss of life
➢ Serious acidification of oceans ➢ Loss of most glaciers	➢ Flooding of major cities e.g. London, New York
➢ Risk of change to atmospheric circulations e.g. the monsoon	➢ Entire regions no longer producing food (e.g. Australia)
➢ On-set of collapse of Amazonian rain-forest	➢ ~500m people at risk of hunger
➢ 15-40% species extinct (incl. mammals e.g. polar bear)	➢ 10m people flooded at coasts ➢ Sharp declines in Africa crops
➢ 10% species extinct ➢ 80% coral bleaches/ dies	➢ ~300,000 people die of climate related diseases

Scale and timing of impacts is uncertain

Note: Not to scale

Source: Intergovernmental Panel on Climate Change, *Third Assessment, Stern Report, analysis and approximations of median point by Bruce Duguid*