Business, Climate Change and the Carbon Market

Carbon Markets Workshop,
For Mexican Business Leaders and Key Government Officials

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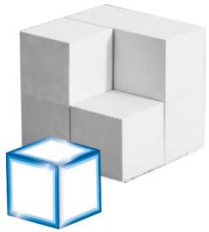
Business, Climate Change and the Carbon Market

- The Carbon Trust
- Investor Engagement at the Carbon Trust
- Climate Change – a Business Revolution?
  - Aluminium
  - Oil and Gas
- Global aviation and the EU ETS

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?

Thought Experiment….

1. Suppose the world DOES cut emissions sufficiently to stabilise global CO2 equivalent concentrations at 550ppm in 2050; via 4 different routes.
2. How will a company perform if it does not anticipate this success?
3. How will it perform if it does anticipate this success?
4. Quantify potential opportunities and risks for company value

Our Approach

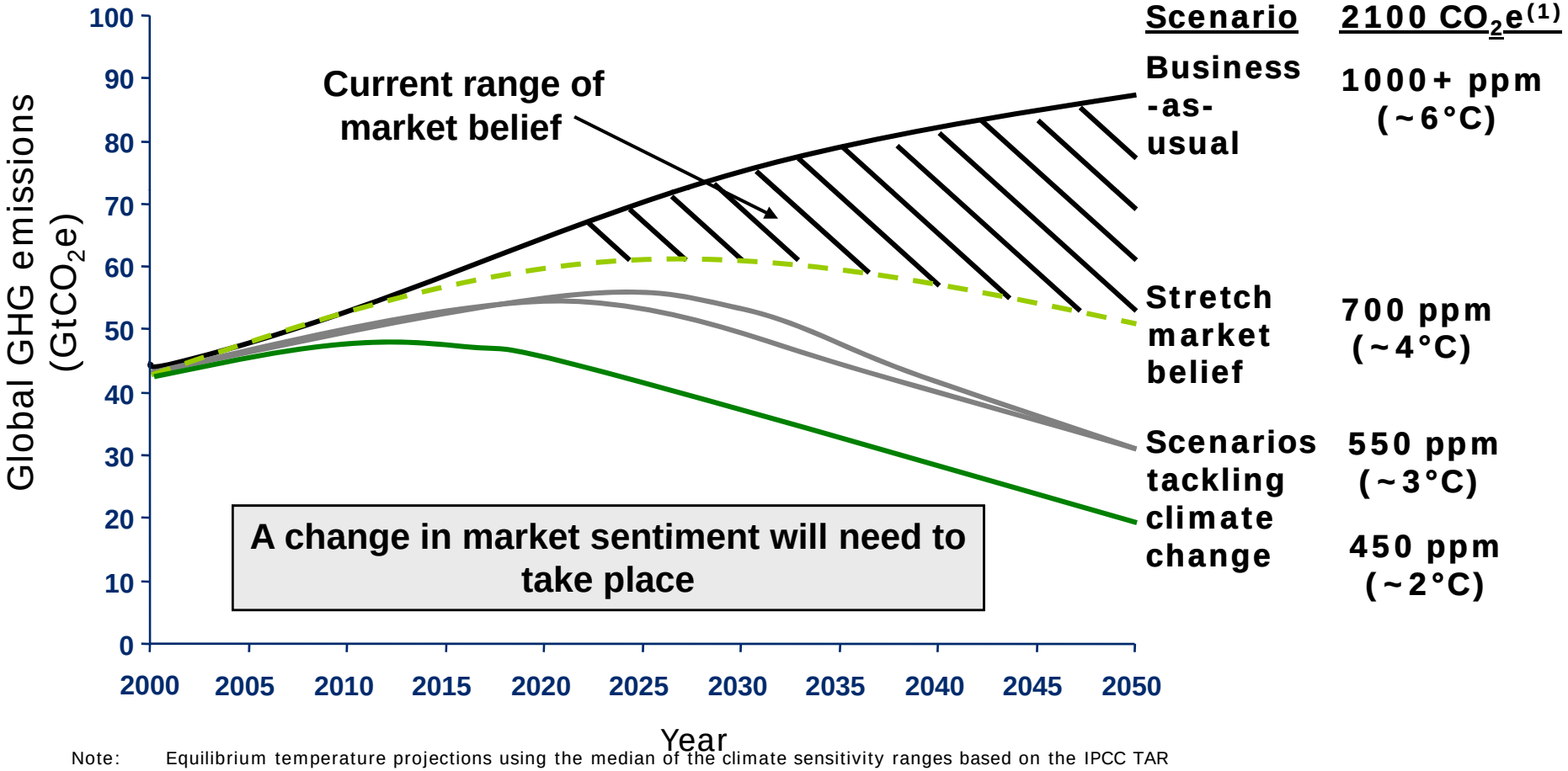
Global study, six sectors:

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

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

Annual global emissions in 2050 will need to be well below today's

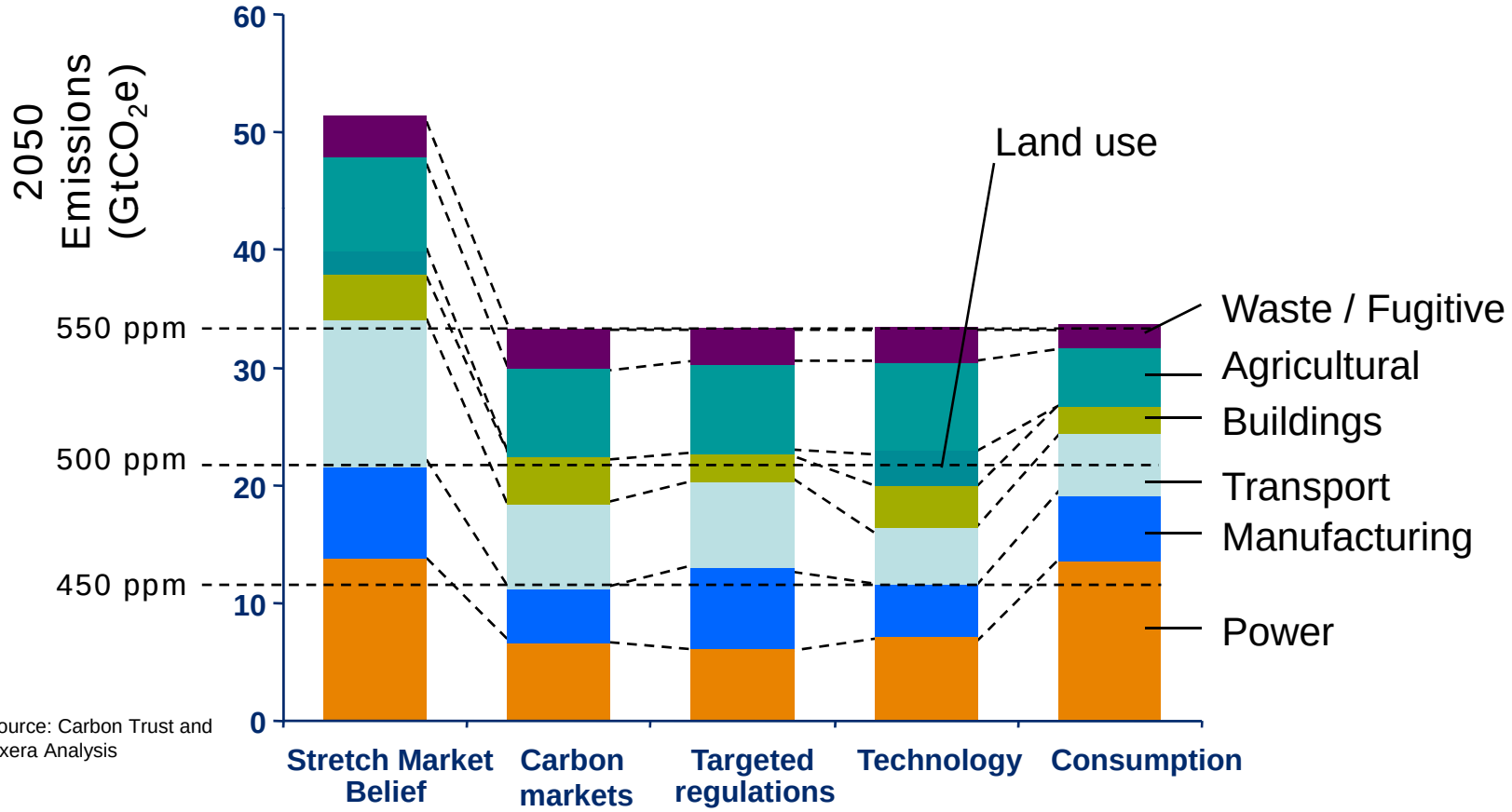
Global GHG emissions projections



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

We create four 'success' scenarios, each led or motivated by a different factor

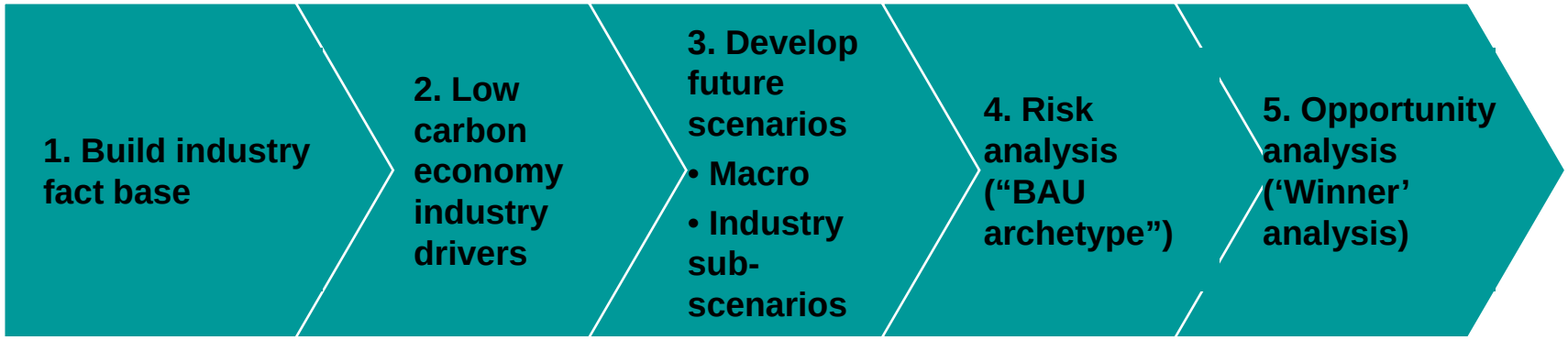
Variation in GHG emissions by source in 2050



Source: Carbon Trust and Oxera Analysis

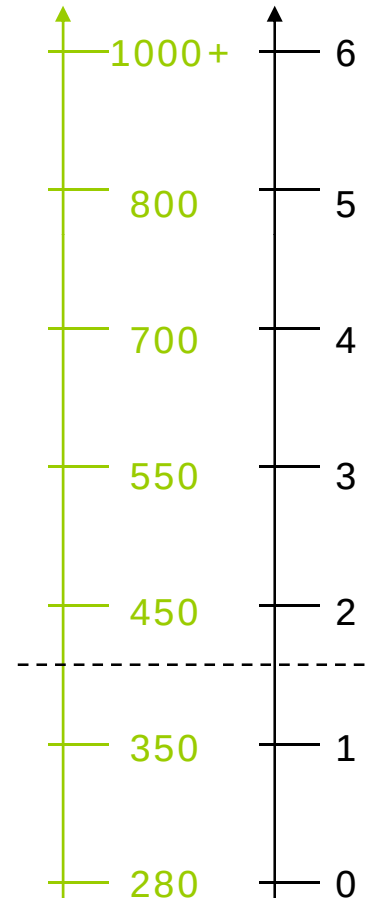
To achieve 450ppm, ALL industries would need to exploit ALL opportunities!

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



Risk and Opportunity is measured via a discounted cash flow model

Temperature is estimated to rise in range of 1.1-6.4C, by 2100



CO_2e (ppm)	°C	Environmental Change	Human Impact
1000+	6	➢ Abrupt, run-away change	➢ Mass loss of life
800	5	➢ Serious acidification of oceans ➢ Loss of most glaciers	➢ Flooding of major cities e.g. London, New York
700	4	➢ Risk of change to atmospheric circulations e.g. the monsoon	➢ Entire regions no longer producing food (e.g. Australia)
550	3	➢ On-set of collapse of Amazonian rain-forest	➢ ~500m people at risk of hunger
450	2	➢ 15-40% species extinct (incl. mammals e.g. polar bear)	➢ 10m people flooded at coasts ➢ Sharp declines in Africa crops
350	1	➢ 10% species extinct ➢ 80% coral bleaches/ dies	➢ ~300,000 people die of climate related diseases
280	0		

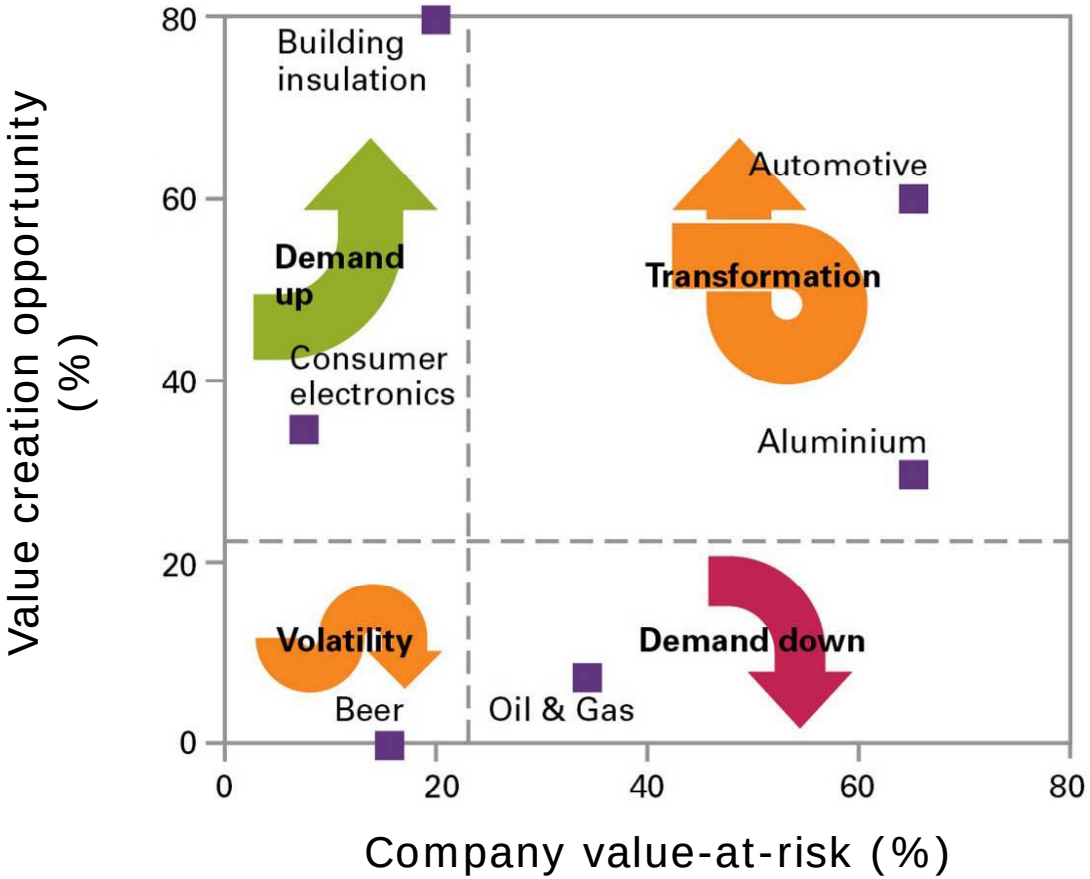
Scale and timing of impacts is uncertain

Note: Not to scale

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

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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Transformation

Aluminium – highly polluting industry faces potential transformation

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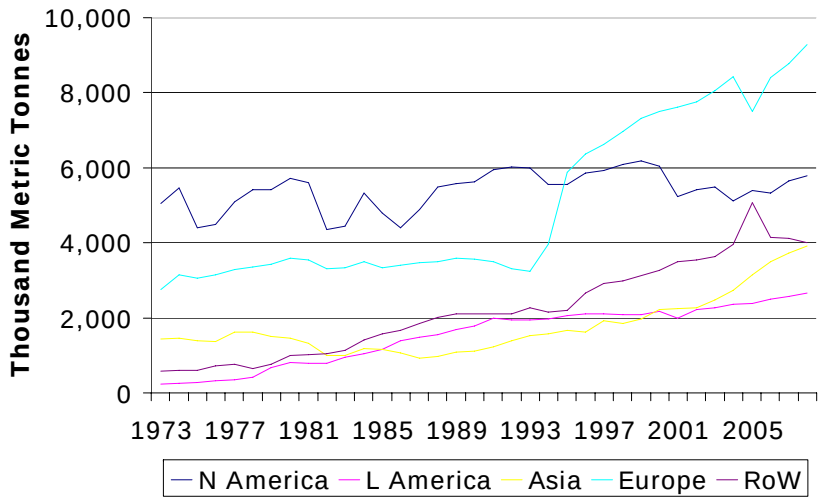
- One of the most carbon intensive industries
- Integral to economic growth
- Strong growth could increase GHG emissions 6 fold by 2050



Source: International Aluminium Institute

Source: Carbon Trust and McKinsey & Co. analysis

High level of direct (process driven) and indirect (electricity generation) emissions

• Direct emissions	tCO2e/t Al
- Production of bauxite and alumina	0.7
- Smelting, process driven emissions	2.5
- Smelting, heating driven emissions	2.3
• Indirect emissions	
- Electricity (thermal generation)	0.0 to 15.0
=>Total emission	13.5

nb. developing recycled aluminium uses less then 1 tonne CO2e/t Al

Source: Carbon Trust and McKinsey & Co. analysis

Aluminium – an industry transformed

- **Companies face:**

- fall in demand as aluminium replaced by substitute materials (plastics, biomass) in packaging, construction, transport

- internalisation of carbon costs: EU producers are short carbon permits from 1 Jan '13, and face higher power prices

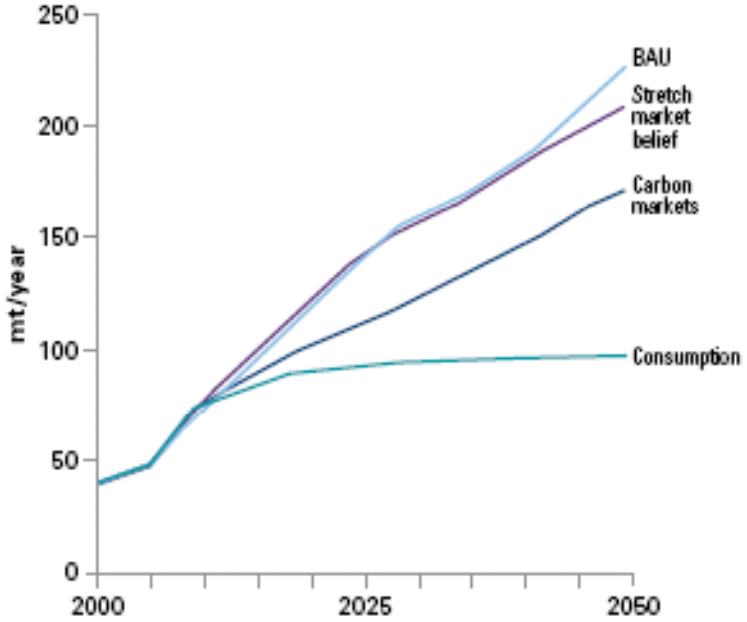
- **Well positioned companies will:**

- obtain access to low carbon power (hydro, nuclear, geo-thermal) (carbon price will widen cost differences between thermal and hydro generators)

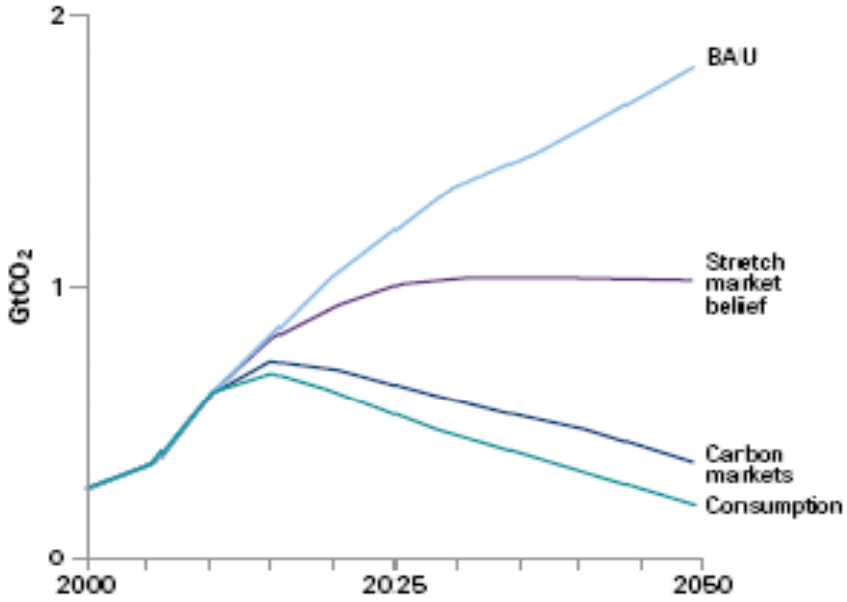
- develop aluminium recycling opportunities (recycled aluminium uses ~95% less energy (<1 tonne CO_2e))

Source: Carbon Trust and McKinsey & Co. analysis

Aluminium consumption (primary and secondary) by scenario



Global CO2 emissions by scenario



Aluminium is so integral to growth that it is hard to see production falling; but carbon efficiency rises in carbon market scenarios

Transformation

Aluminium value opportunity & risk

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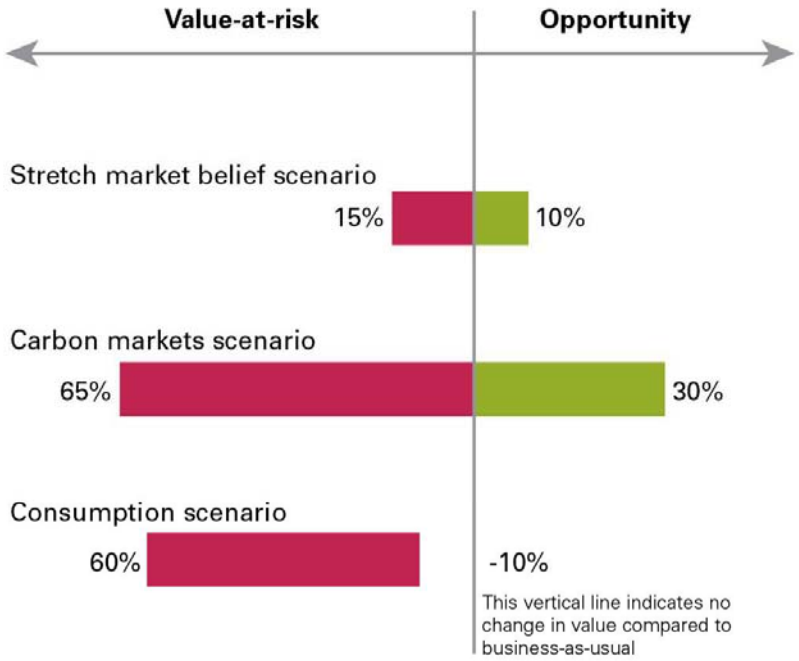
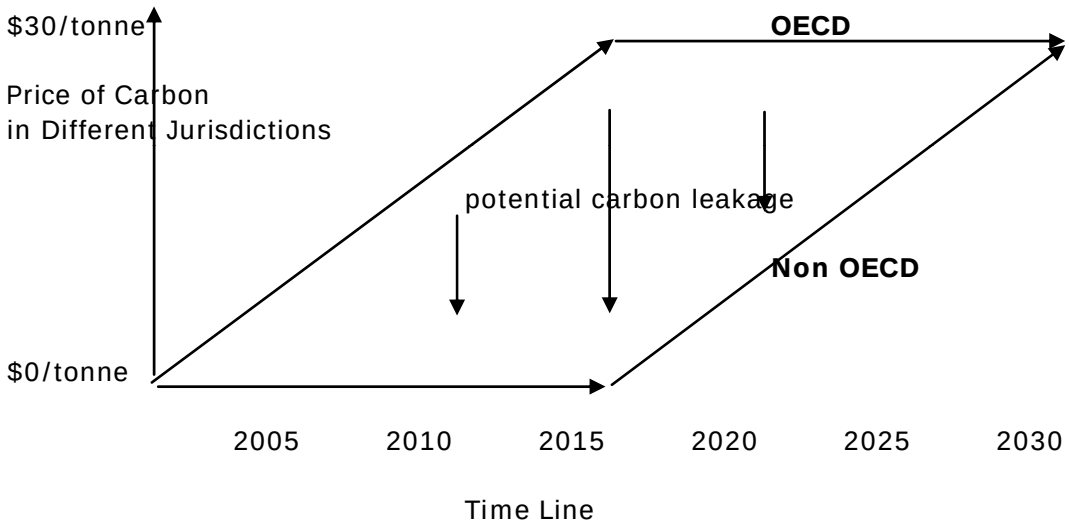
Alternative scenarios



Successful company: runs high proportion of renewable energy (80% hydro, 10% nuclear, 10% fossil fuel, does not suffer from carbon leakage, buys into recycling)

Source: Carbon Trust and McKinsey & Co. analysis

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



EU firms face unlevel playing field to 2030, when global C02 pricing may begin (or EU taxes imports that do not internalise carbon costs)

Source: Carbon Trust and McKinsey & Co. analysis

Aluminium – and the EU-ETS

EU aluminium producers will be included in the EU-ETS from 1 Jan 2013, the first year of phase 3 (2013 to 2020).

In 2013, 20% of all permits allocated to the aluminium sector will be auctioned, with the remaining 80% handed out (grandfathered) for free. Auctioning should rise from 20% in 2013 to 70% in 2020.

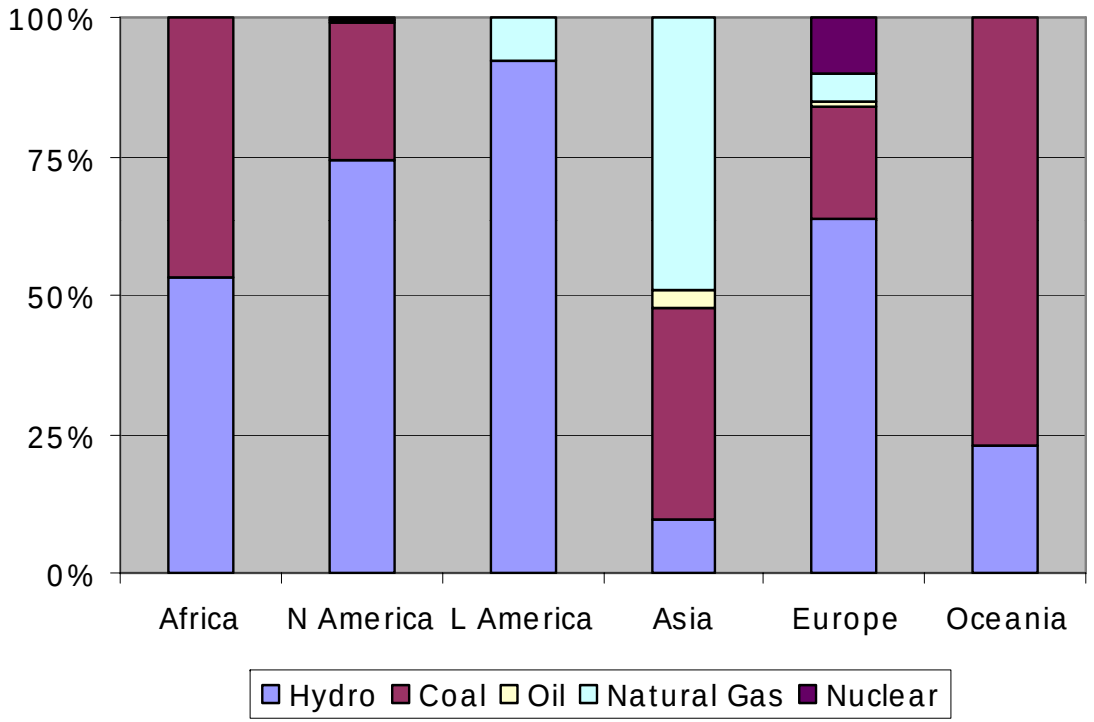
Companies could avoid the permit shortfall, however, if they show that they would suffer significant carbon leakage (i.e.. industry would move overseas and no overall emission reduction would be achieved).

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

Source: Carbon Trust and McKinsey & Co. analysis

Fuel source – hydro and nuclear generation the best

Energy Sources for Primary Energy Production, by World Region

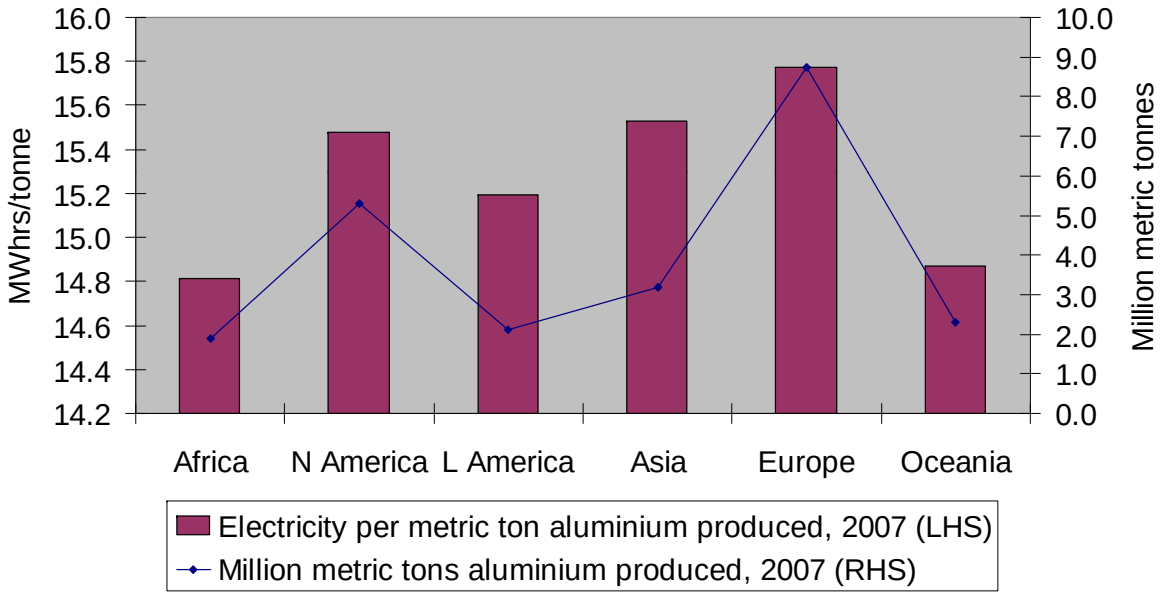


Source: International Aluminium Institute

Europe and US still use a lot of coal for aluminium production

Energy efficiency – emerging markets often rank ahead

Electricity used per metric tonne of aluminium produced, and metric tonnes of aluminium produced, by world region

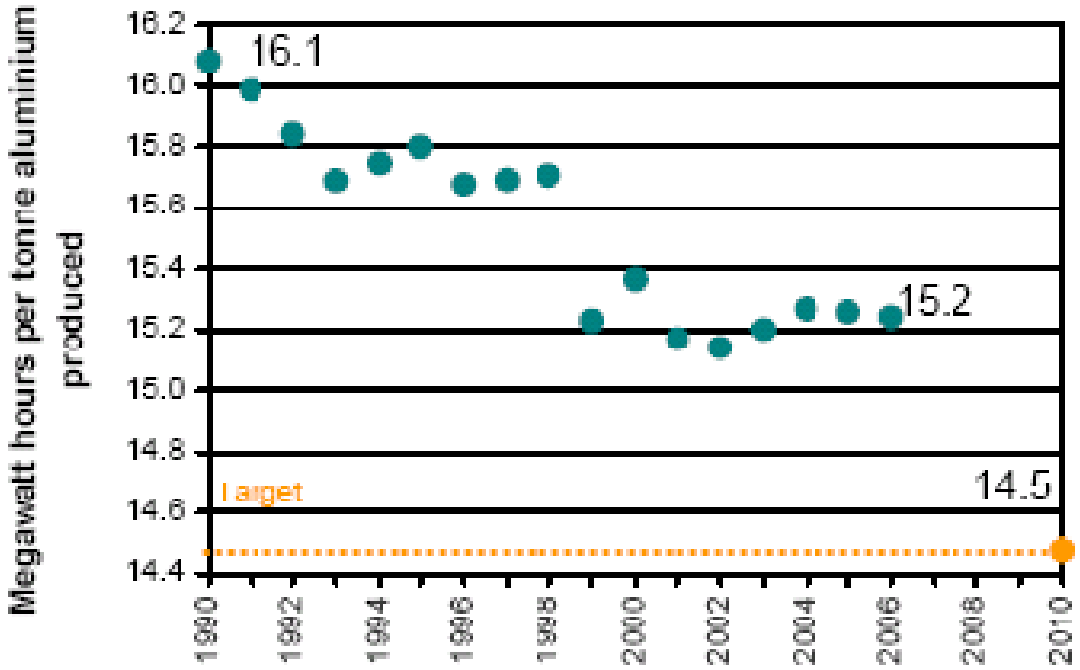


Source: International Aluminium Institute

Europe produces the most aluminium, with the least efficient plants

Source: Carbon Trust and McKinsey & Co. analysis

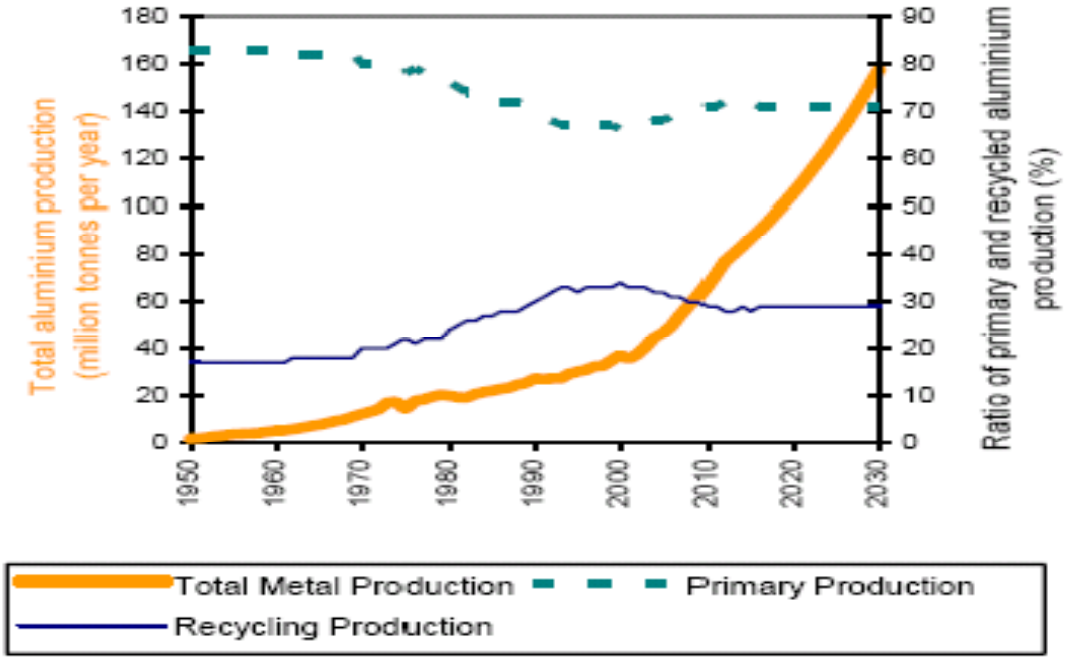
Energy efficiency - IAI members offered 10% improvement by 2010 vs. 1990



Source: International Aluminium Institute

IAI members may fail to achieve this target

Recycling - IAI projects sharp rise in production, no rise in recycling rates….



Source: International Aluminium Institute

"this ratio of recycled to primary sourced metal is unlikely to change in the short to medium term"
IAI, Aluminium for Future Generations, 2007 Update

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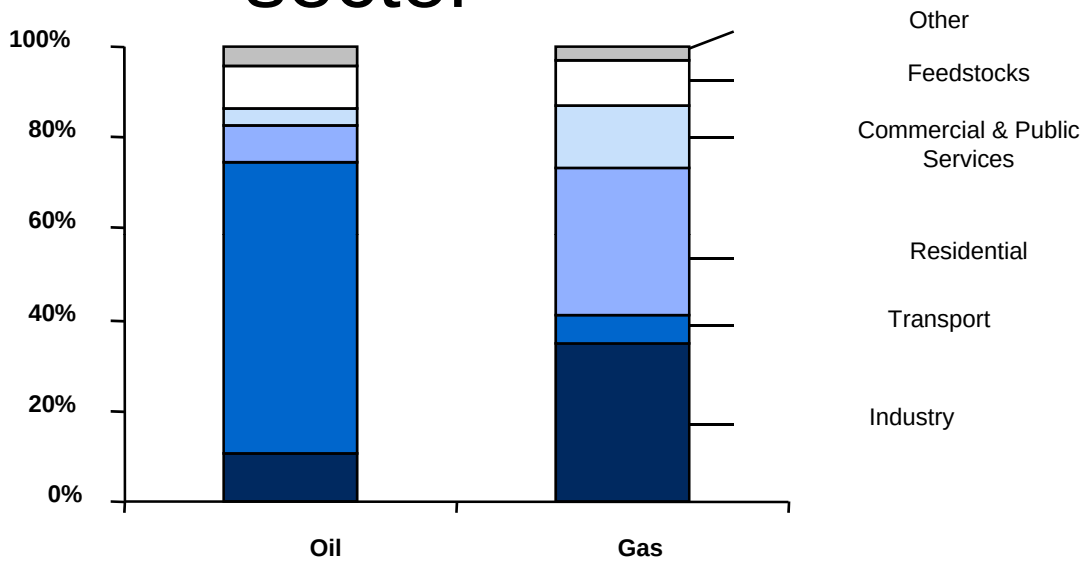
Oil consumption largely would be driven by changes in the transport sector



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

	energy / GDP	CO2 / energy
Power		fuel switching move to nuclear move to renewables move to biomass switch coal to gas
Transport	lighter, smaller, more energy efficient cars	switch car to biofuels swith to biofuels

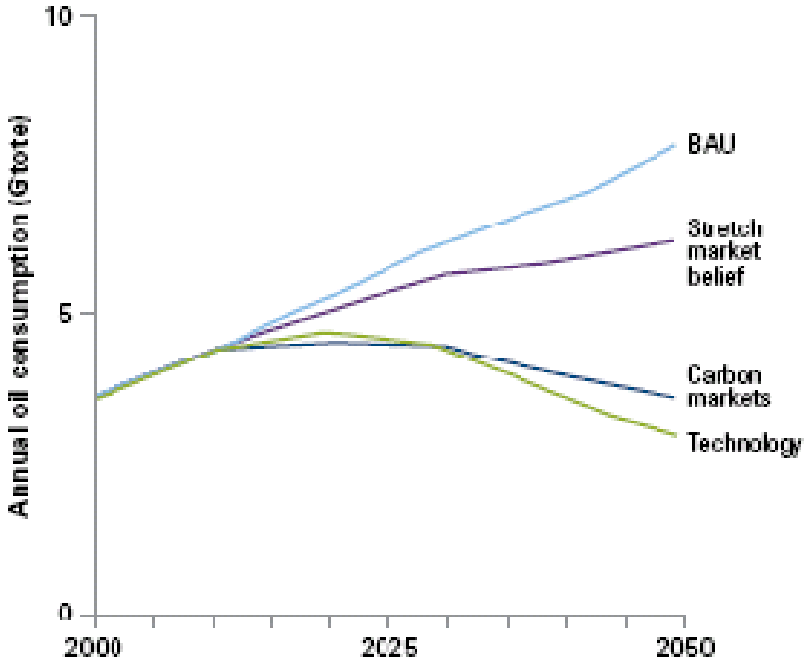
CO2e emissions = GDP x energy intensity of GDP x carbon intensity of energy use

toe/GDP
unit of energy used/unit of GDP

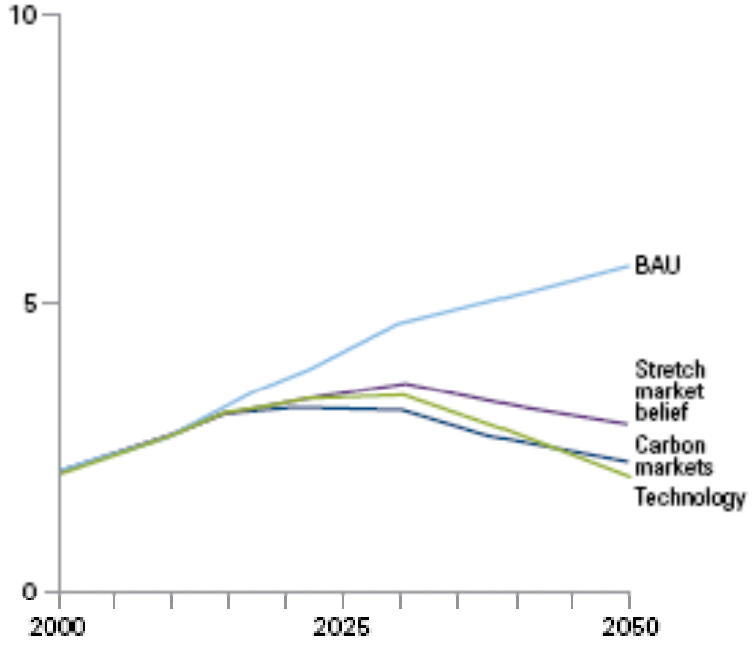
tCO2e/toe
CO2e emissions/unit of energy used

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

Oil consumption in the four scenarios

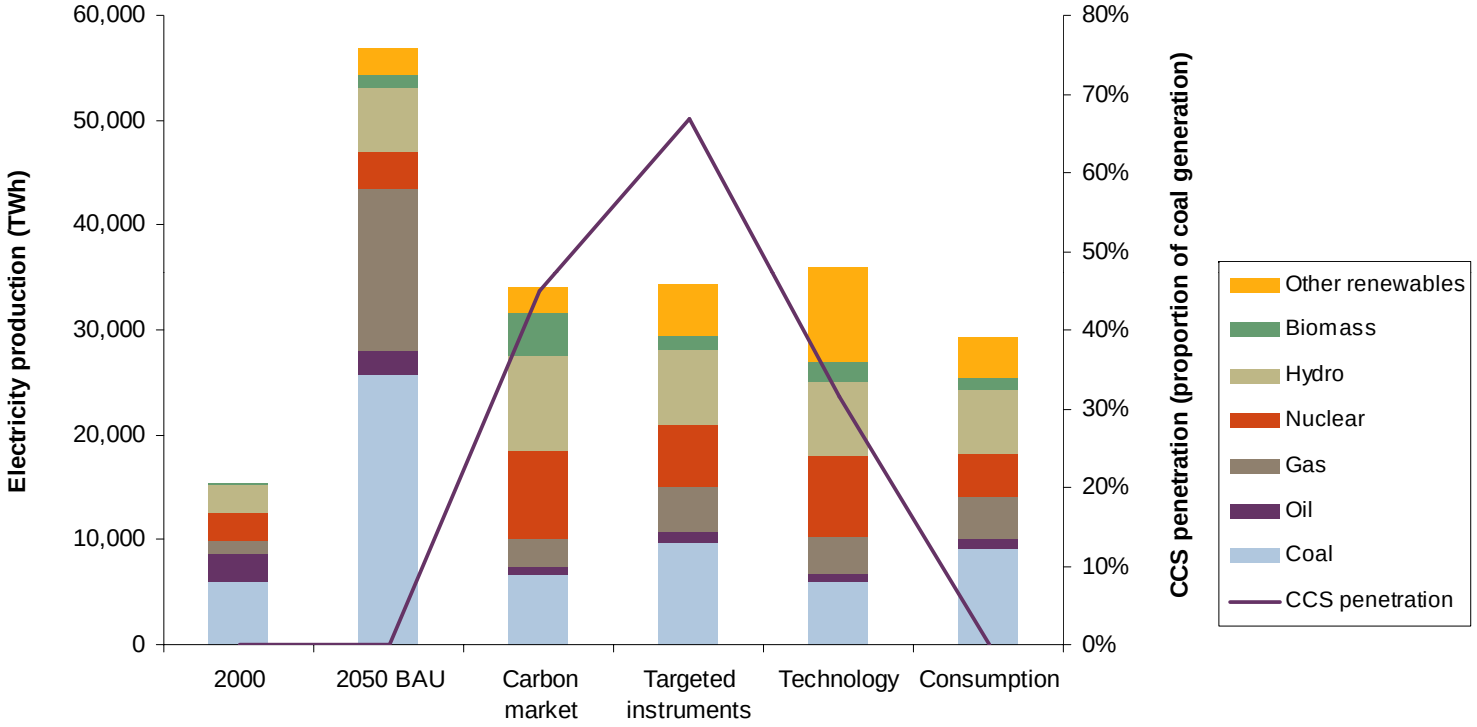


Gas consumption in the four scenarios



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

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

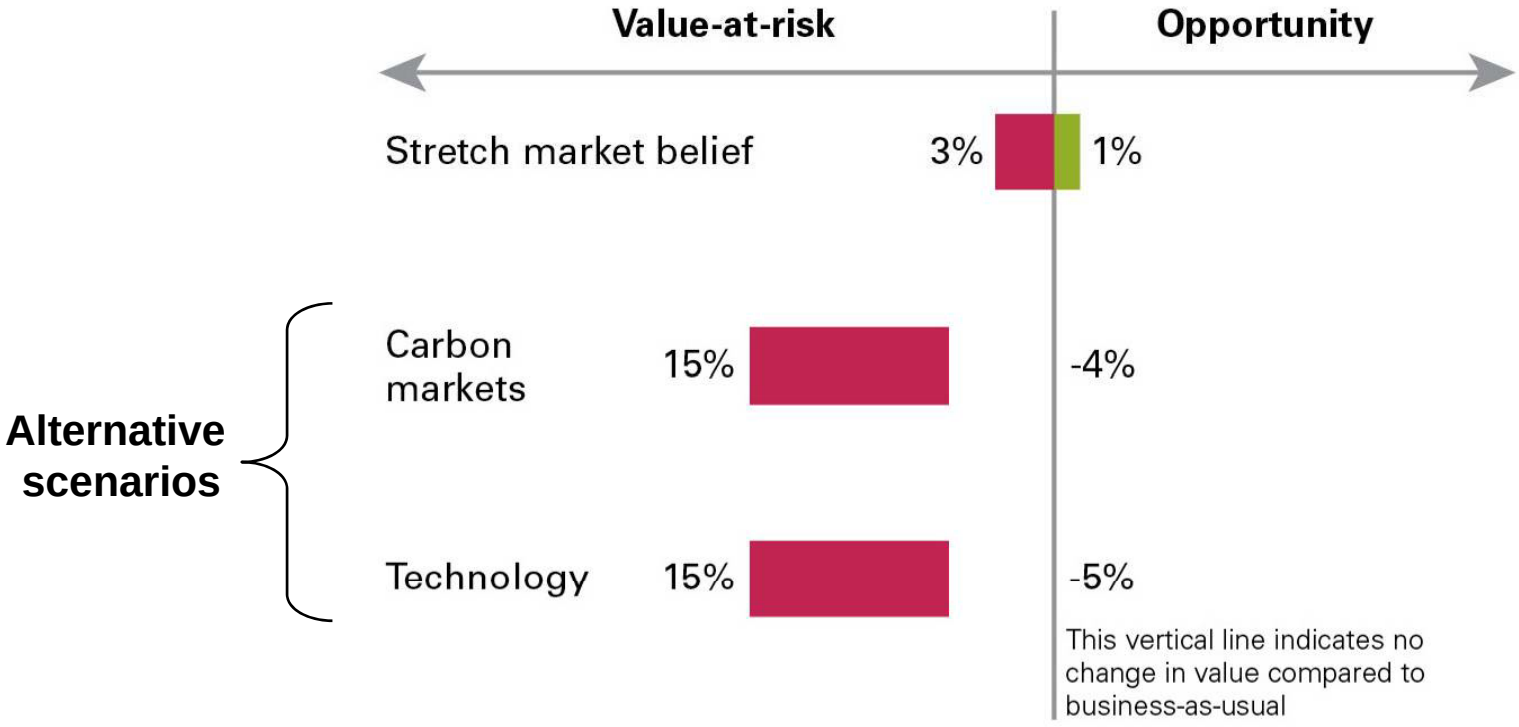
How vertically integrated players are impacted: fall in demand and price are "double whammy"

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

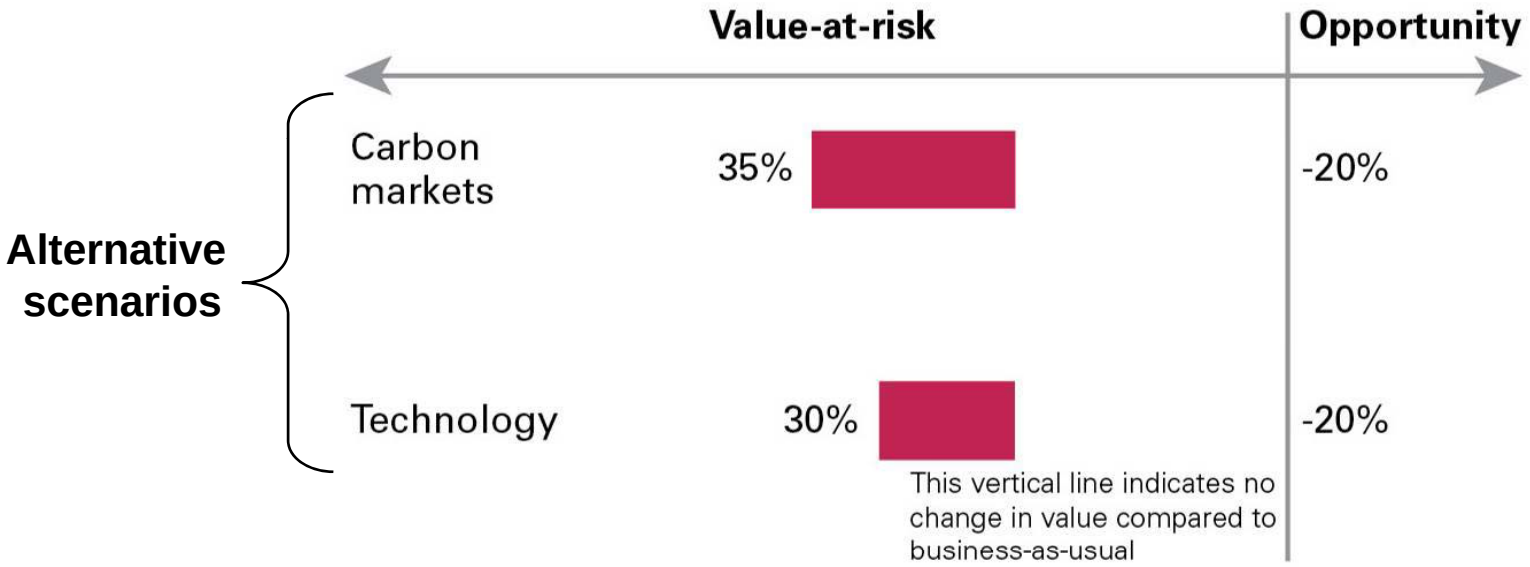
Excluding oil price shifts



Source: Carbon Trust and McKinsey & Co. analysis

Oil exploration & production value opportunity & risk

Including oil price shifts



Source: Carbon Trust and McKinsey & Co. analysis

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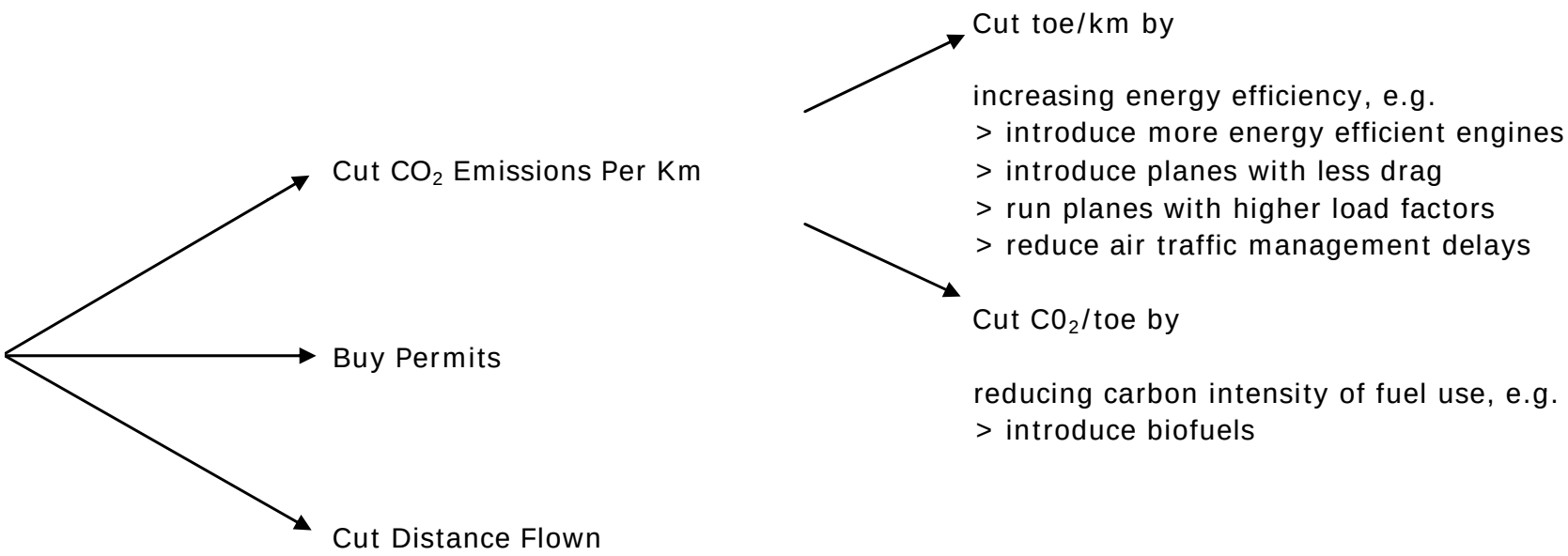
Industrial Sectors and Date of Their Inclusion in the EU ETS

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Phase 1			Phase 2					Phase 3							
Power generation	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>
Steel	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>
Iron	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>
Cement	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>
Glass	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>
Oil refineries	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>
Ceramics	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>
Pulp & paper	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>
Metallic ore	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>
Coke	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>
Aviation								>	>	>	>	>	>	>	>	>
Chemicals									>	>	>	>	>	>	>	>
Aluminium									>	>	>	>	>	>	>	>

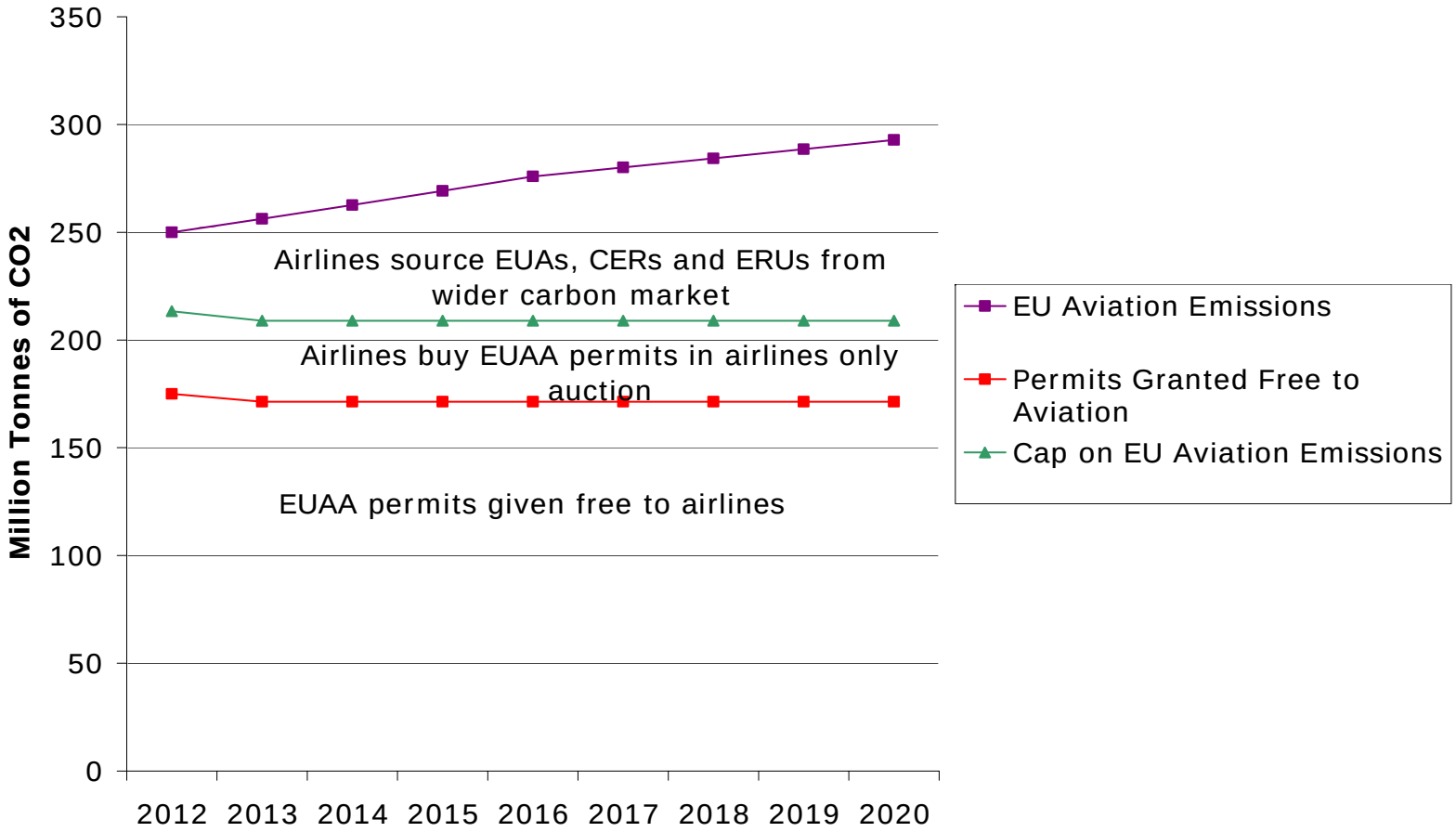
Source: Carbon Trust and McKinsey & Co. analysis

Options for the Aviation Industry in a Carbon Capped World



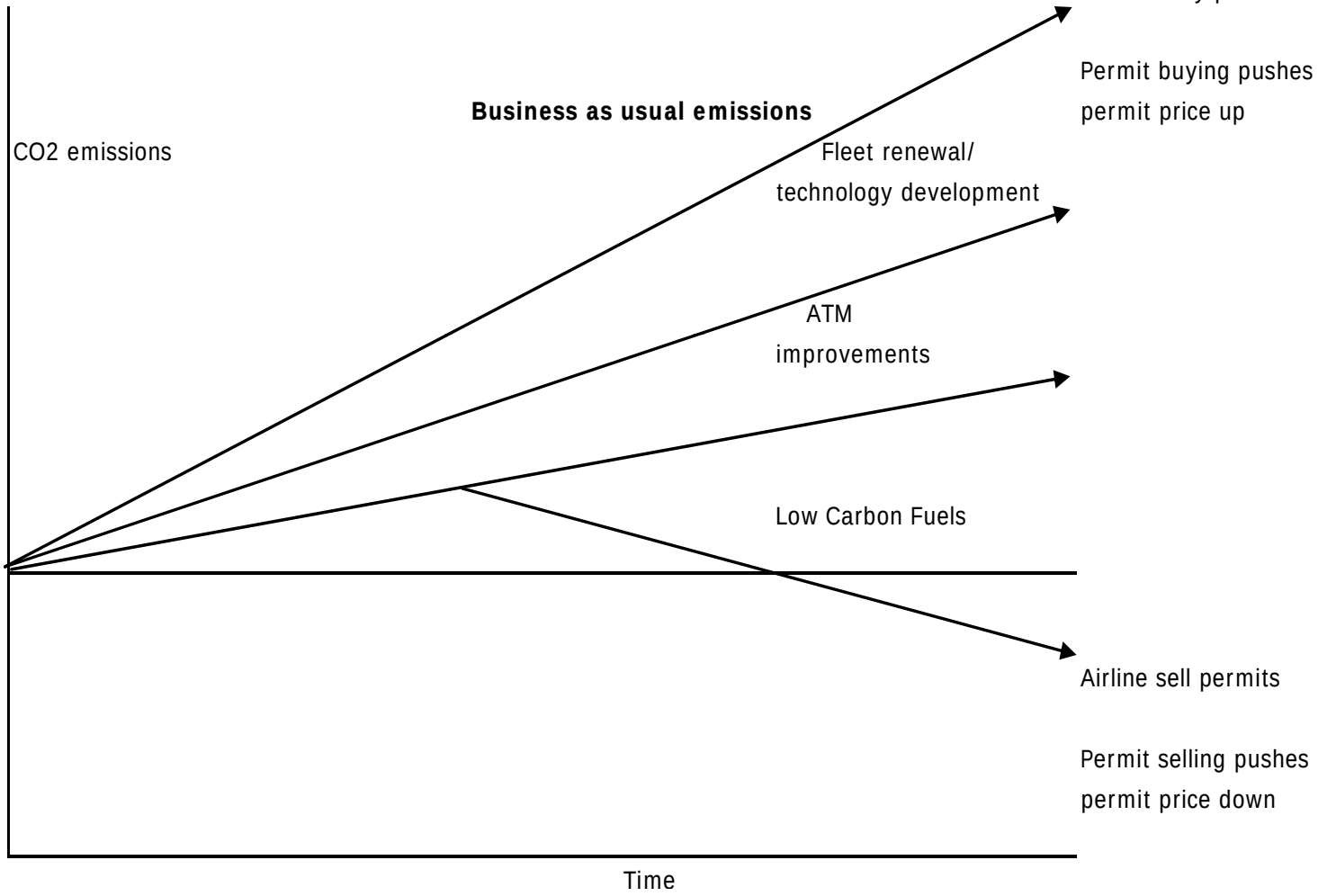
Source: Carbon Trust

Aviation Cap, Free Permits and Possible Future Emissions, 2000 to 2020



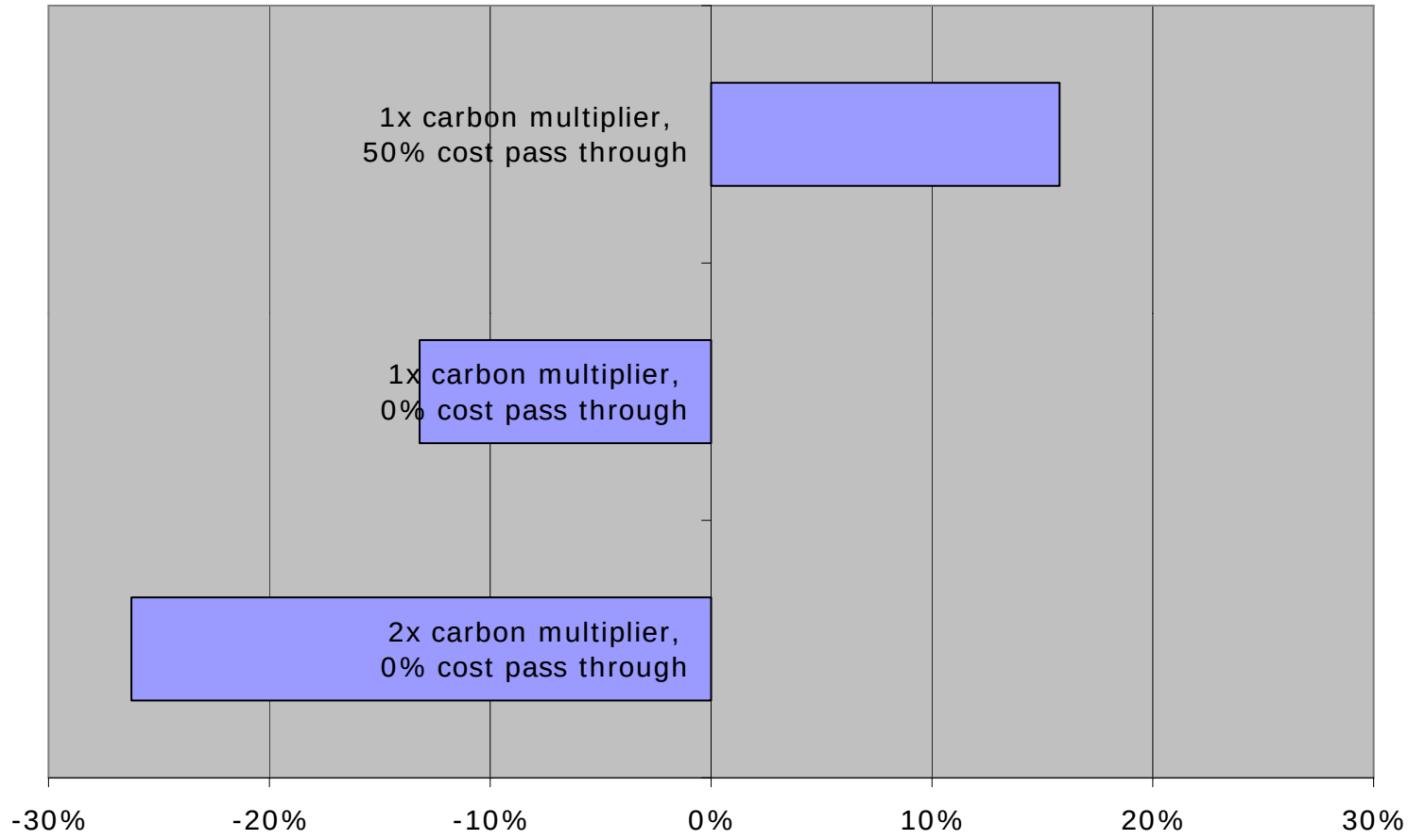
Source: Carbon Trust

Methods to Reduce the Rise in Aviation CO2 Emissions



Source: Carbon Trust

Percentage change in 2012 EBIT, with €25/tonne carbon price, vs. €0/tonne, in three situations, (assuming 2%/annum passenger growth and 1%/annum energy efficiency)



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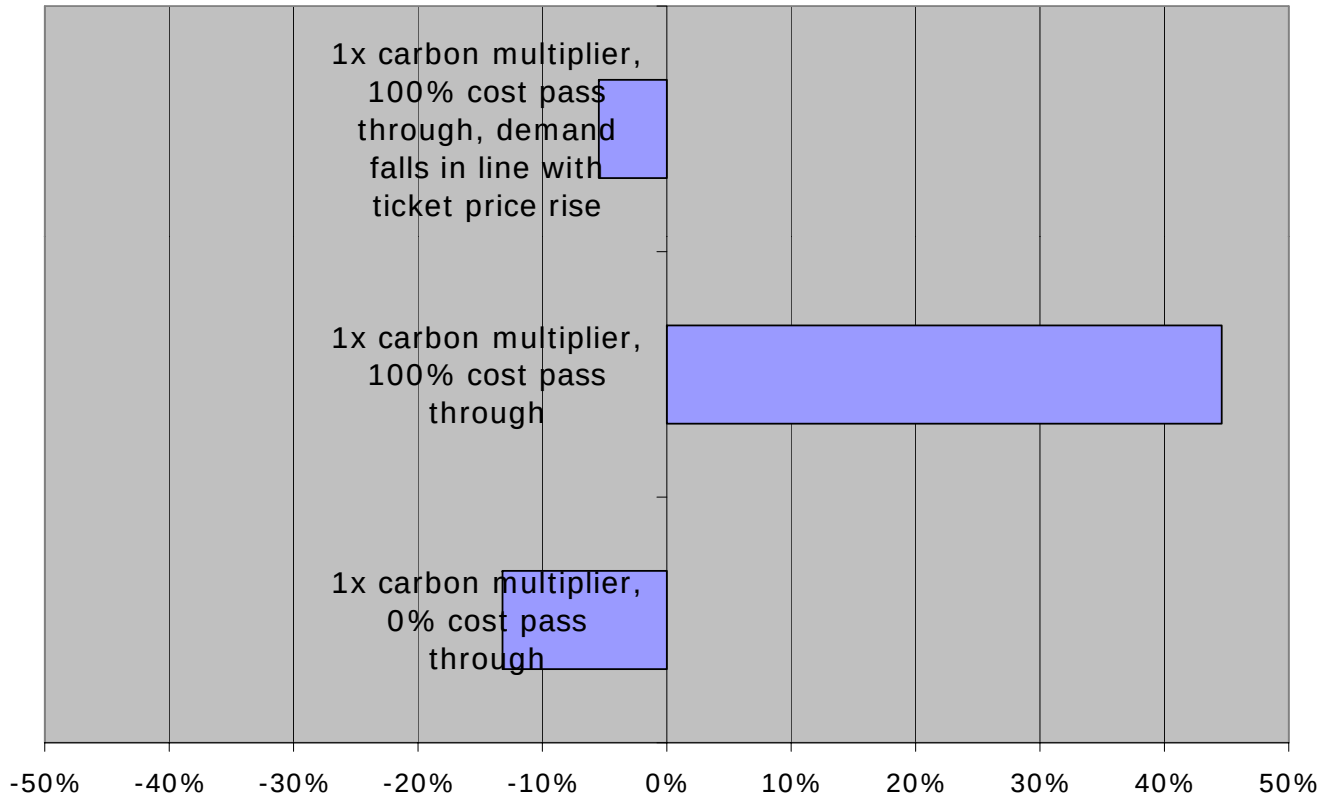

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