Emissions and Climate Change
What can Europe do?

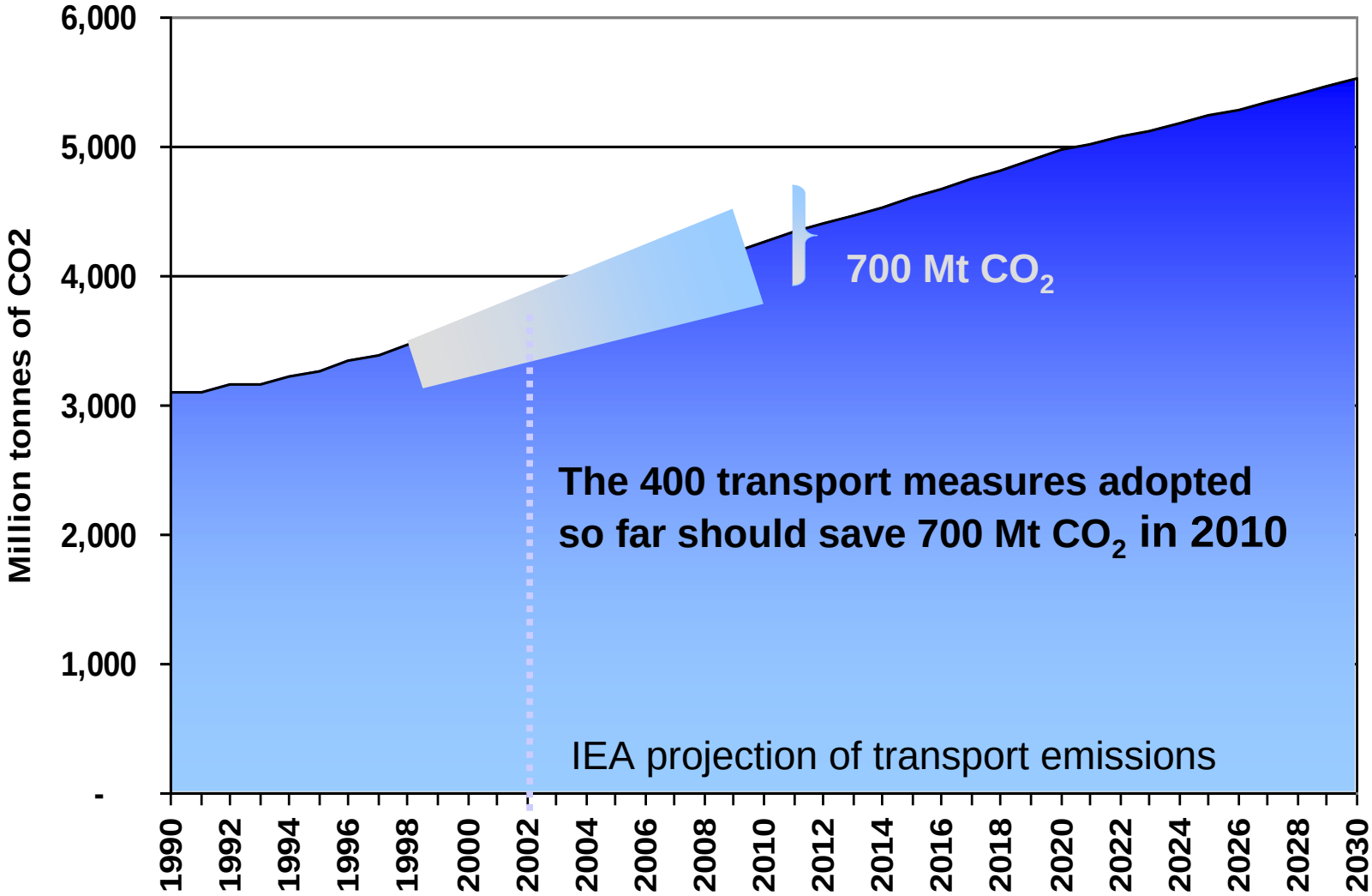
Cutting transport CO_2 emissions:
Putting effectiveness & value for money centre stage

Stephen Perkins

Does cost-effectiveness matter?

- 2nd best argument – transport should mitigate more because limited de-localisation effects
- High cost measures have attracted political support
  - Hydrogen
  - Biofuels
  - Modal shift
  - Hybrids
- Despite low effectiveness
- Effective measures weak political support

ITF Transport Sector Emissions: Potential Impact of Current Policies

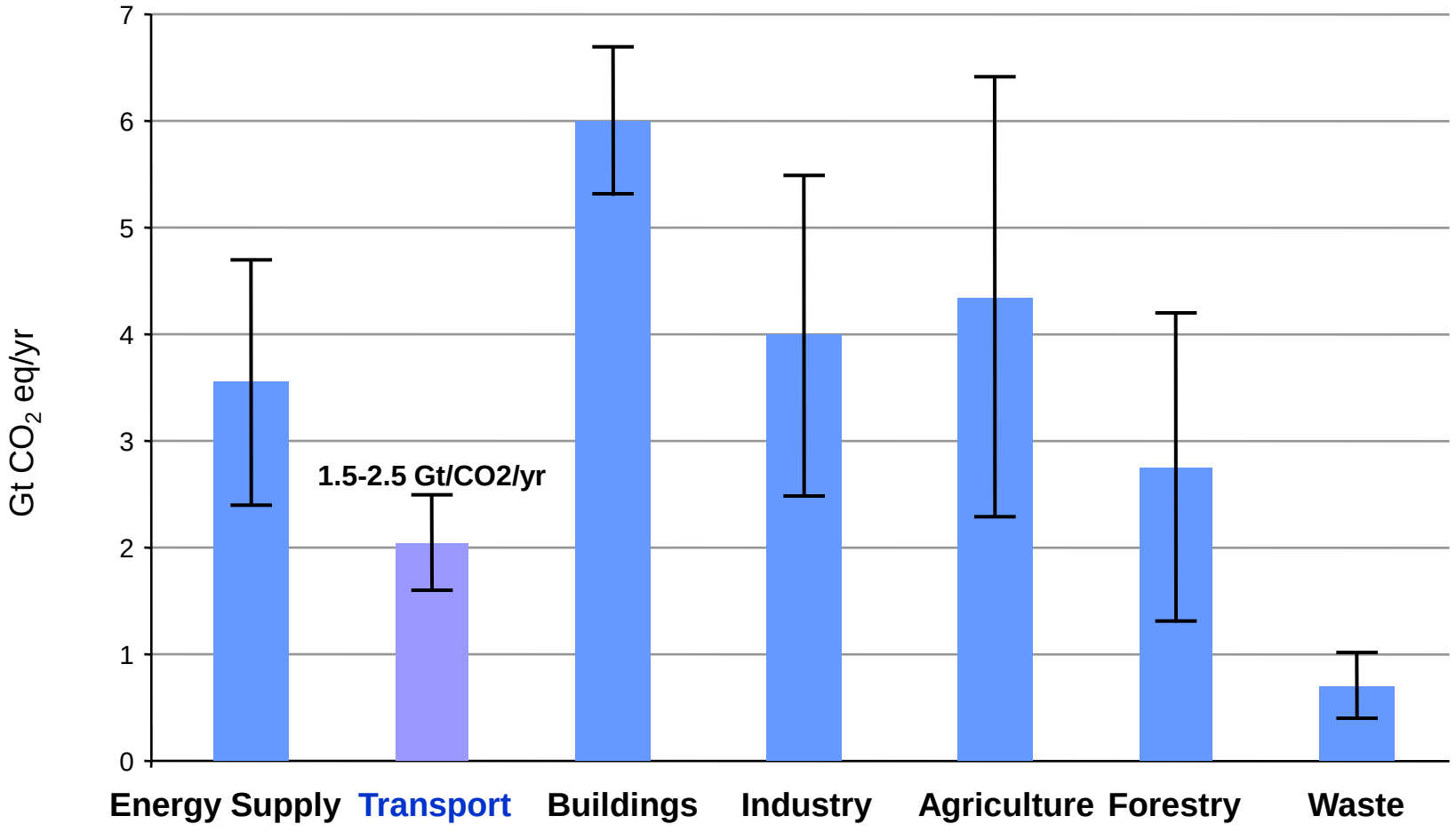


Policy Implications

- More action needed if growth in transport emissions is to be cut.
- How much?
  - Power & heat sector will make biggest cuts
  - Some relatively low cost measures available in all sectors
  - Within transport some expensive measures implemented while cheap measures ignored

IPCC Sectoral GHG Abatement Potential for the World

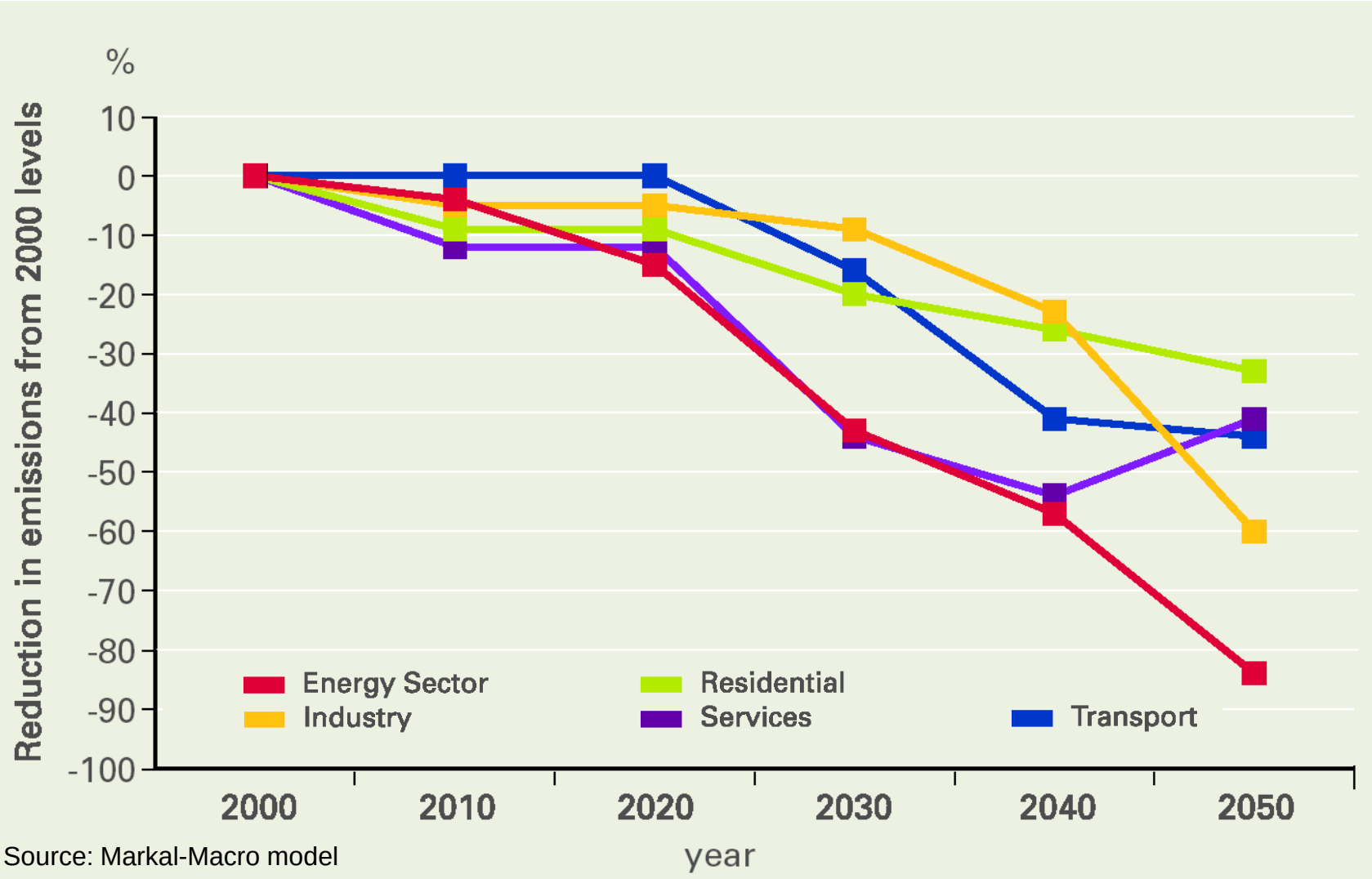
(Gt CO_2 eq/yr at less than \$100/tCO_2)



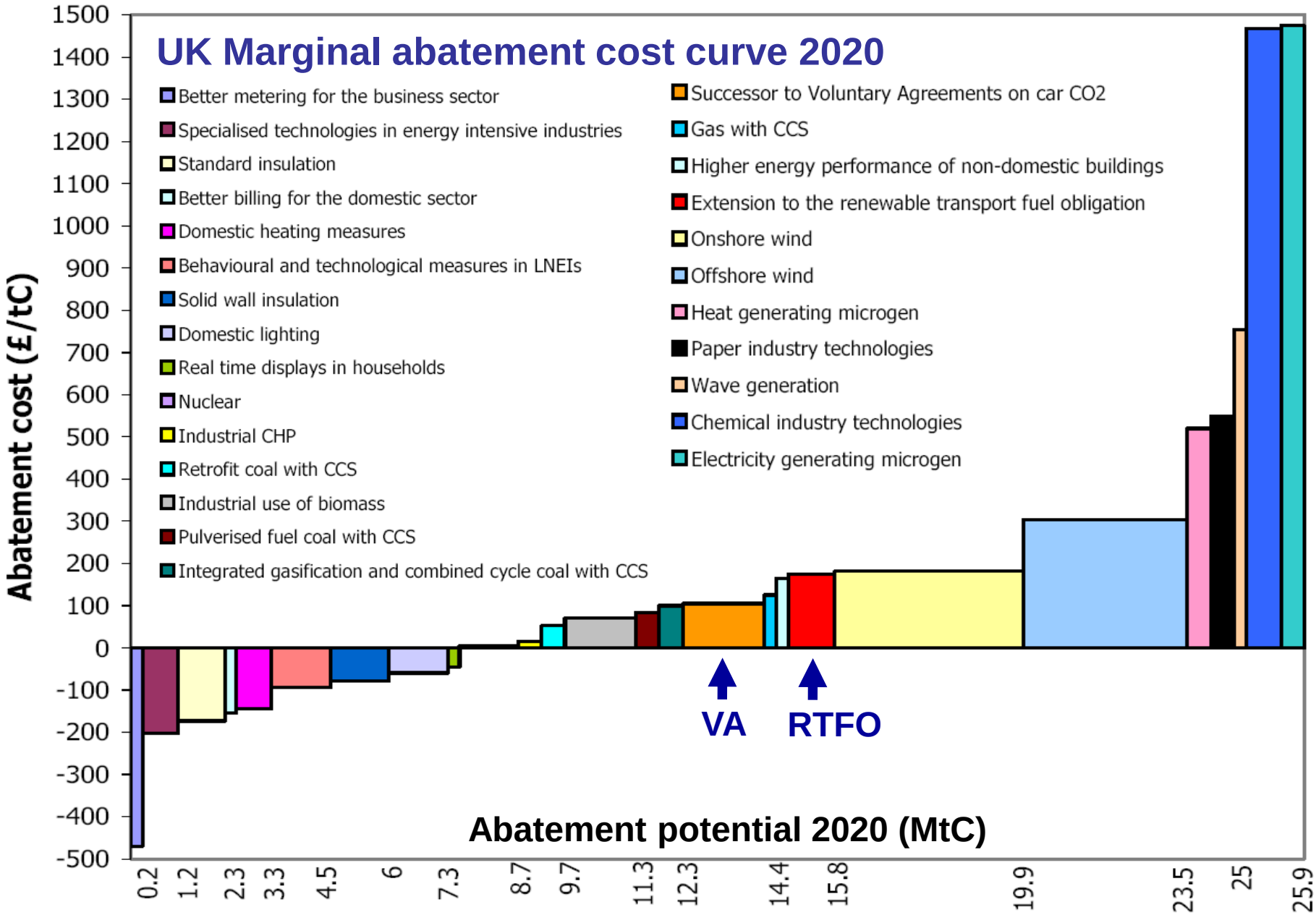
IPCC Fourth Assessment Report

UK Modeled CO_2 Emission Reductions by Sector

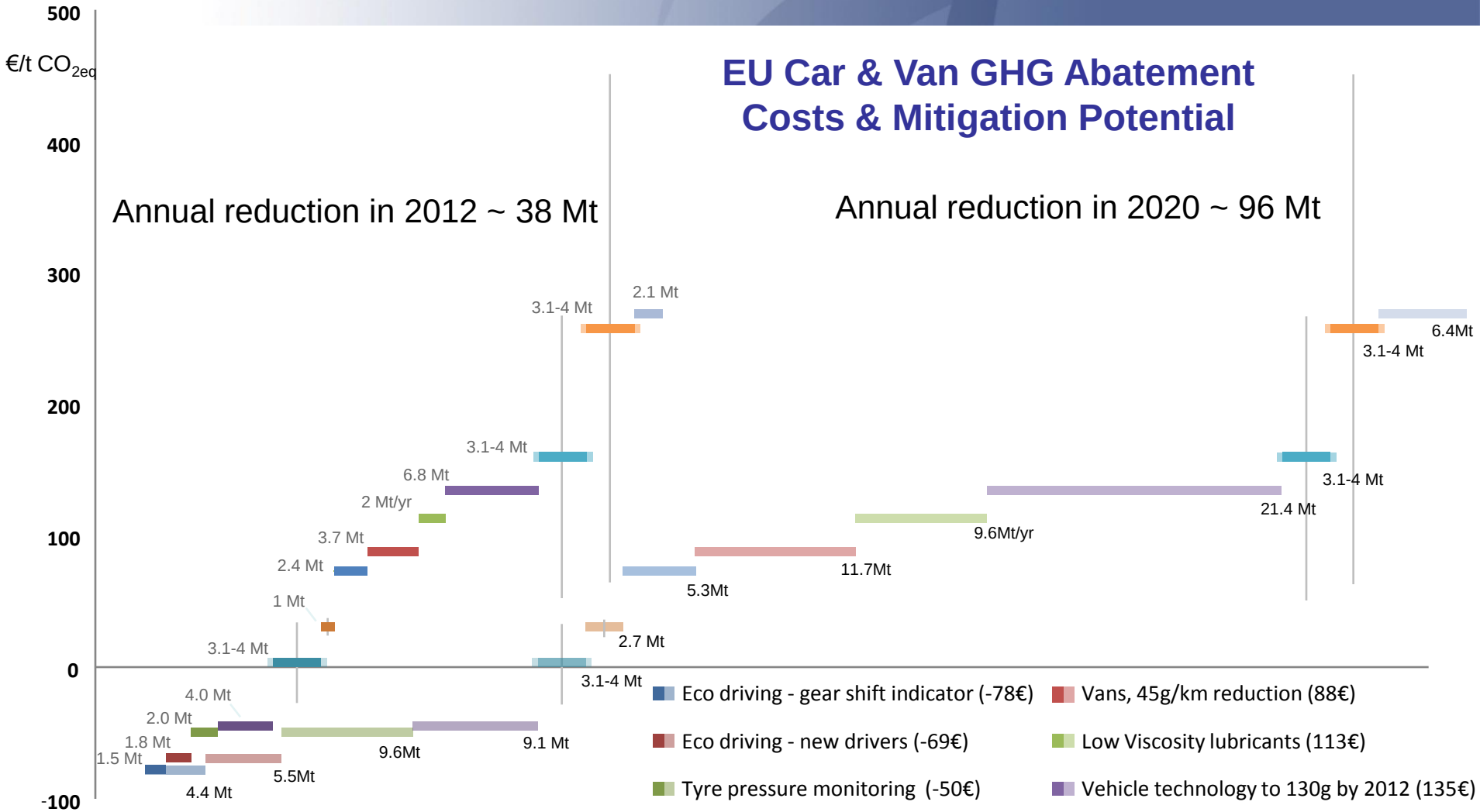
Scenario Showing Least Cost Route to 60% Reduction by 2050



Source: Markal-Macro model

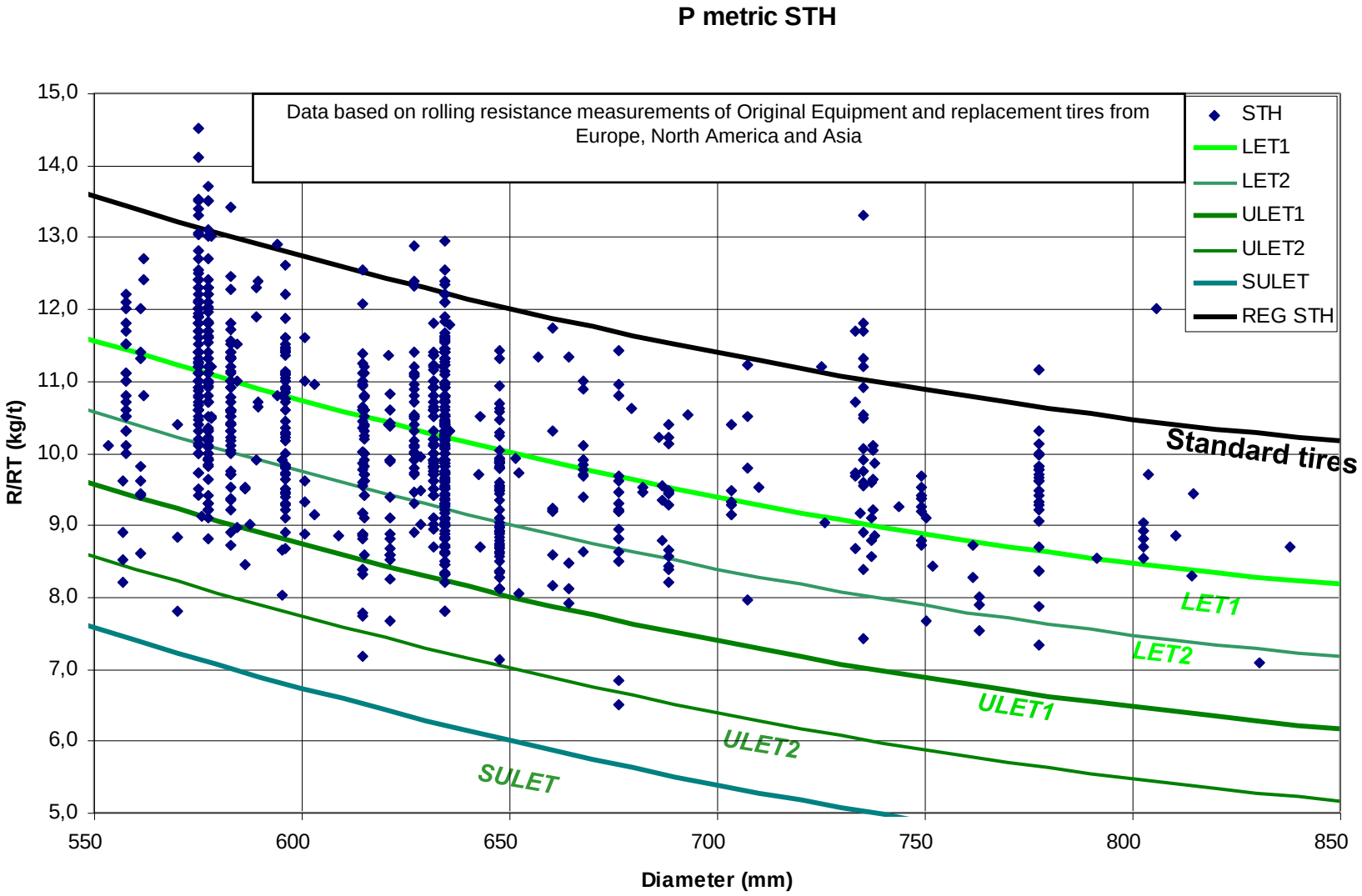

UK Marginal abatement cost curve 2020
Better metering for the business sector
Specialised technologies in energy intensive industries
Standard insulation
Better billing for the domestic sector
Domestic heating measures
Behavioural and technological measures in LNEIs
Solid wall insulation
Domestic lighting
Real time displays in households
Nuclear
Industrial CHP
Retrofit coal with CCS
Industrial use of biomass
Pulverised fuel coal with CCS
Integrated gasification and combined cycle coal with CCS
Successor to Voluntary Agreements on car CO2
Gas with CCS
Higher energy performance of non-domestic buildings
Extension to the renewable transport fuel obligation
Onshore wind
Offshore wind
Heat generating microgen
Paper industry technologies
Wave generation
Chemical industry technologies
Electricity generating microgen
Abatement cost (£/tC)
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
-100
-200
-300
-400
-500
VA
RTFO
Abatement potential 2020 (MtC)
0.2
1.2
2.3
3.3
4.5
6
7.3
8.7
9.7
11.3
12.3
14.4
15.8
19.9
23.5
25
25.9

EU Car & Van GHG Abatement Costs & Mitigation Potential

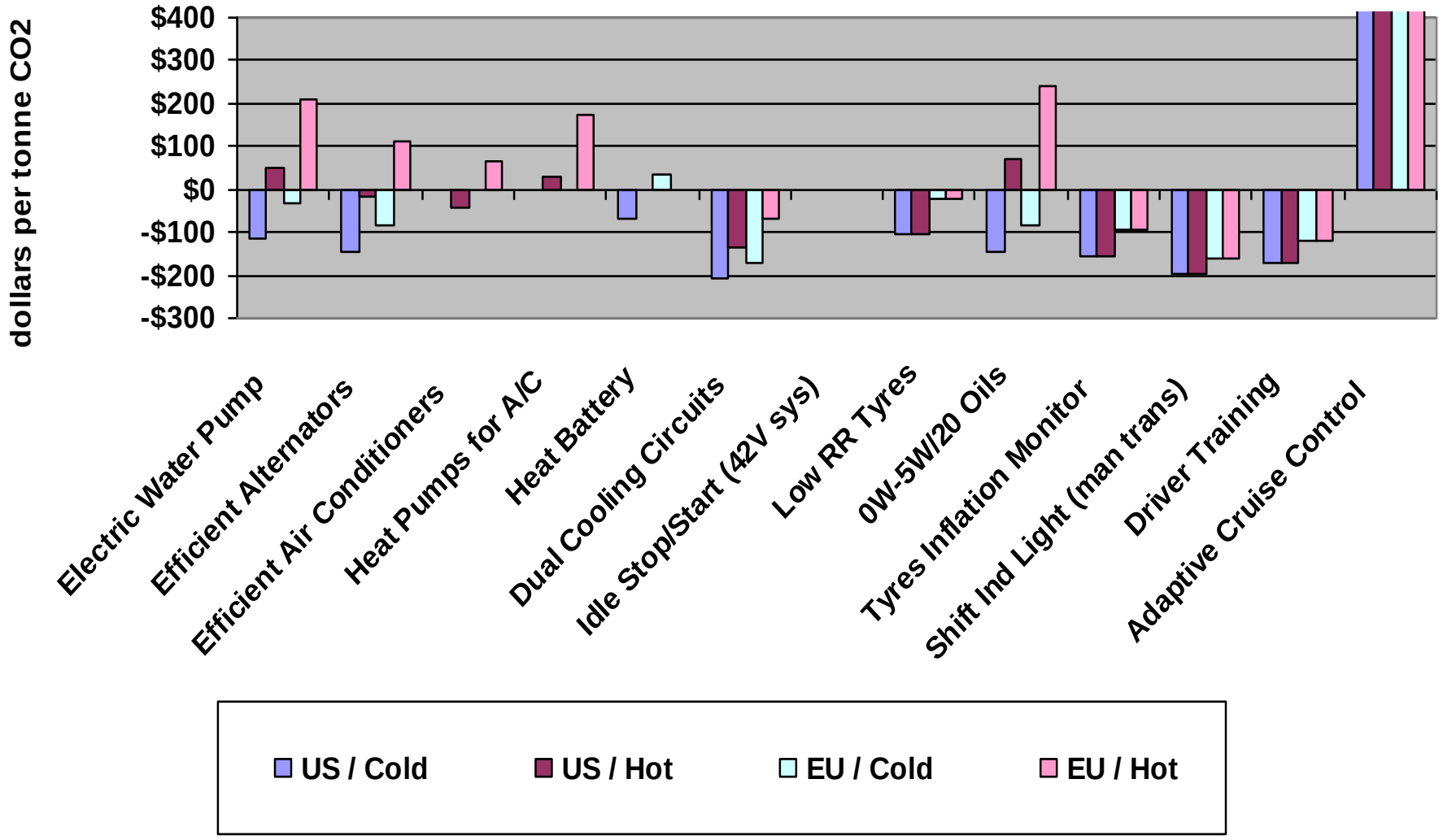


Source: TNO, IEEP, LATS

Possible regulatory standard & energy efficiency "bins" for tyres



Low Cost Vehicle Component Improvements



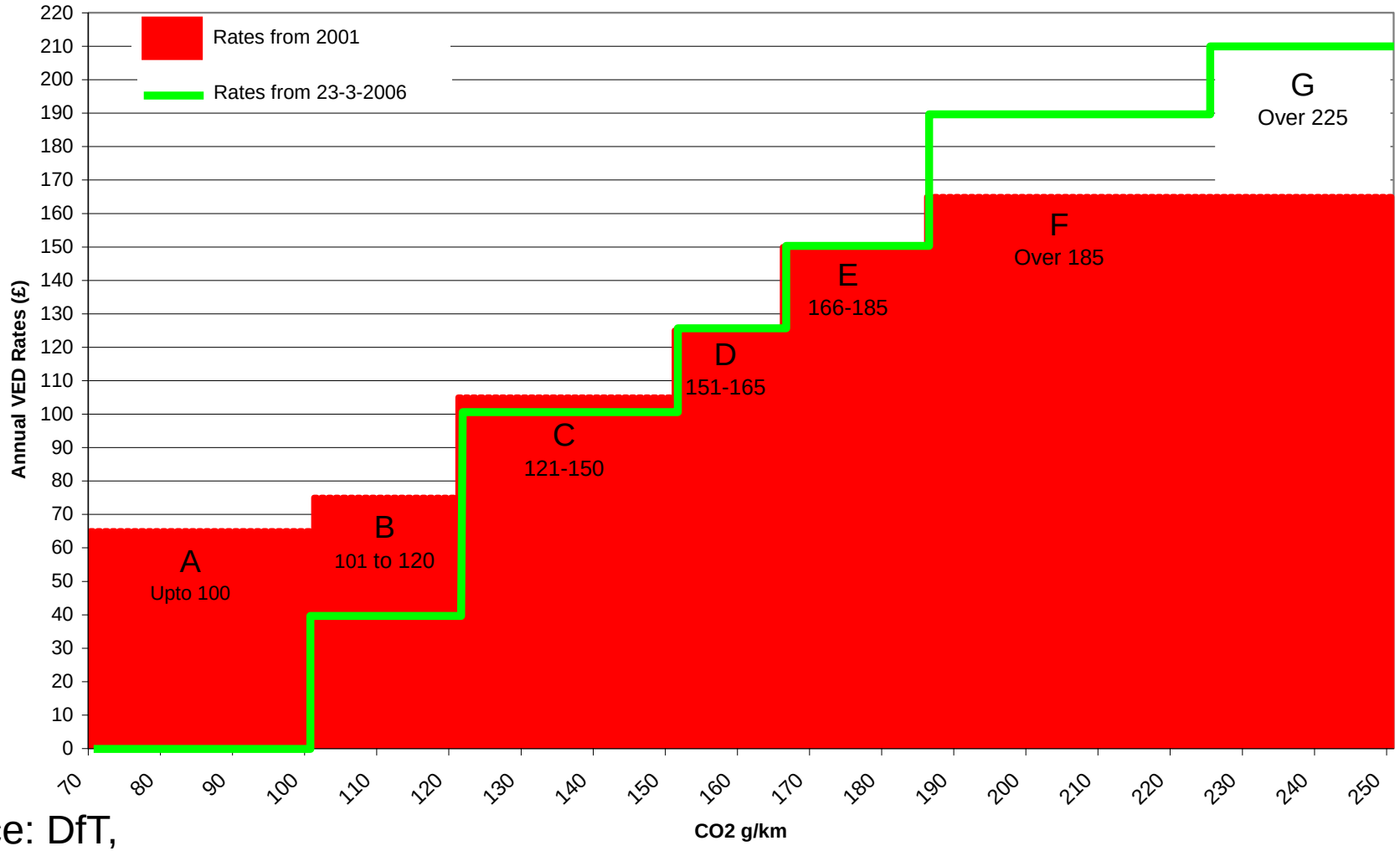
- Tyres, cruise control, air con effective under all conditions
  - combined these could save up 5-10% of fuel.
- Most technologies are most effective under cold conditions with dense traffic
  - water pump, energy efficient alternator, heat battery and 5W-20 oil most cost-effective
  - combined these could save up to 10% of fuel.
  - especially important for Northern climates
- Diesels: lower potential for improvement

Core Vehicle Technology

Technology	Δ efficiency	Cost/vehicle £
Direct injection & lean burn	10 - 13%	200 - 400
Variable valve actuation	5 - 7%	175 - 250
Engine downsizing with turbocharging	10 - 15%	150 - 300
Dual clutch transmission	4 - 5%	400 - 600
Stop-start	3 - 4%	100 - 200
Stop-start with regenerative braking	7%	350 - 450
Electric motor assist	7%	1000
Reduced friction components	3-5%	negligible
Lightweighting	10%	250 - 500
Low rolling resistance tyres	2 - 4%	50 - 100
Aerodynamics	2 - 4%	negligible

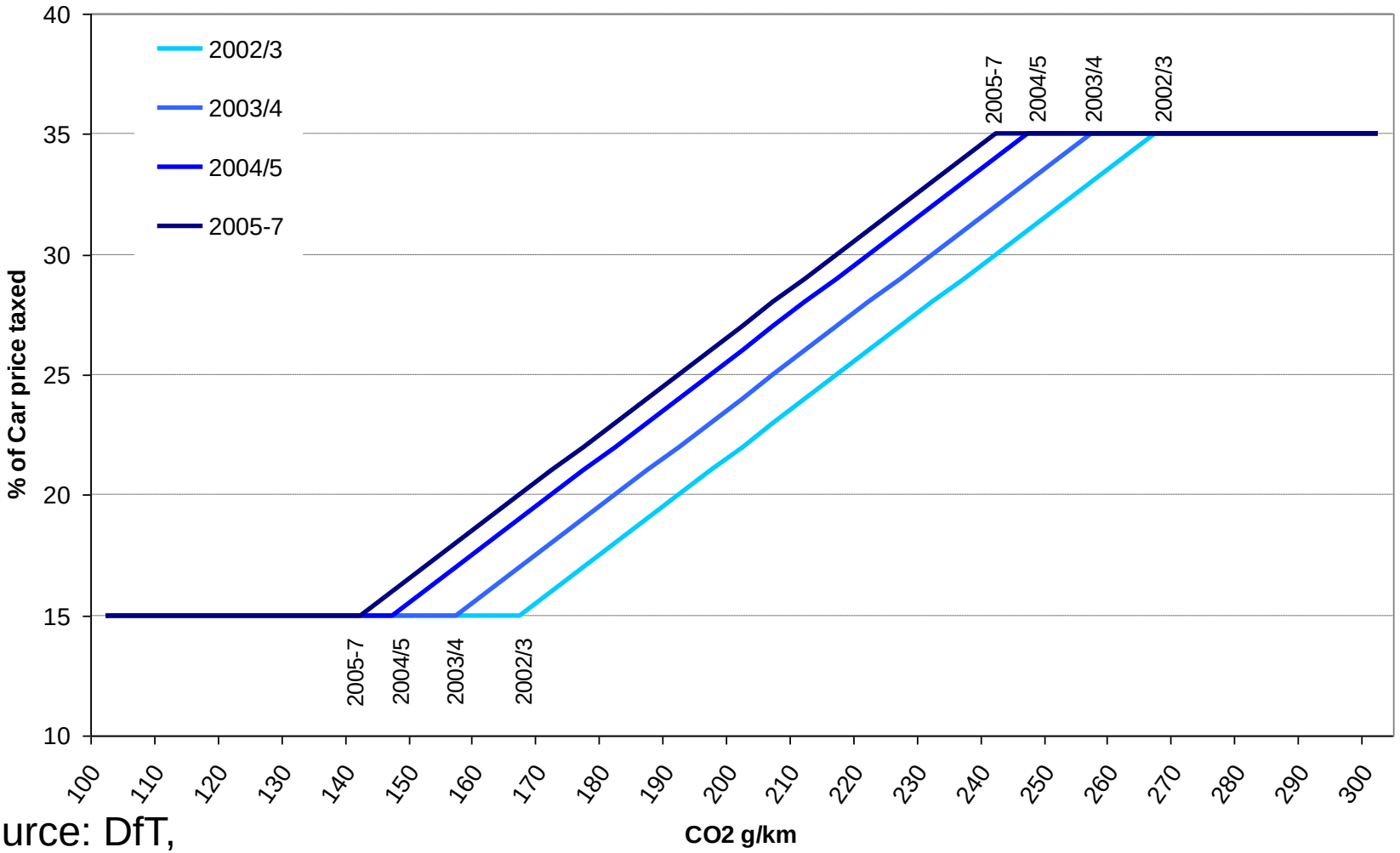
Source: King 2007 based on IEA, IEEP, CARB, Ricardo.

Differentiation of annual circulation tax for private cars in the UK



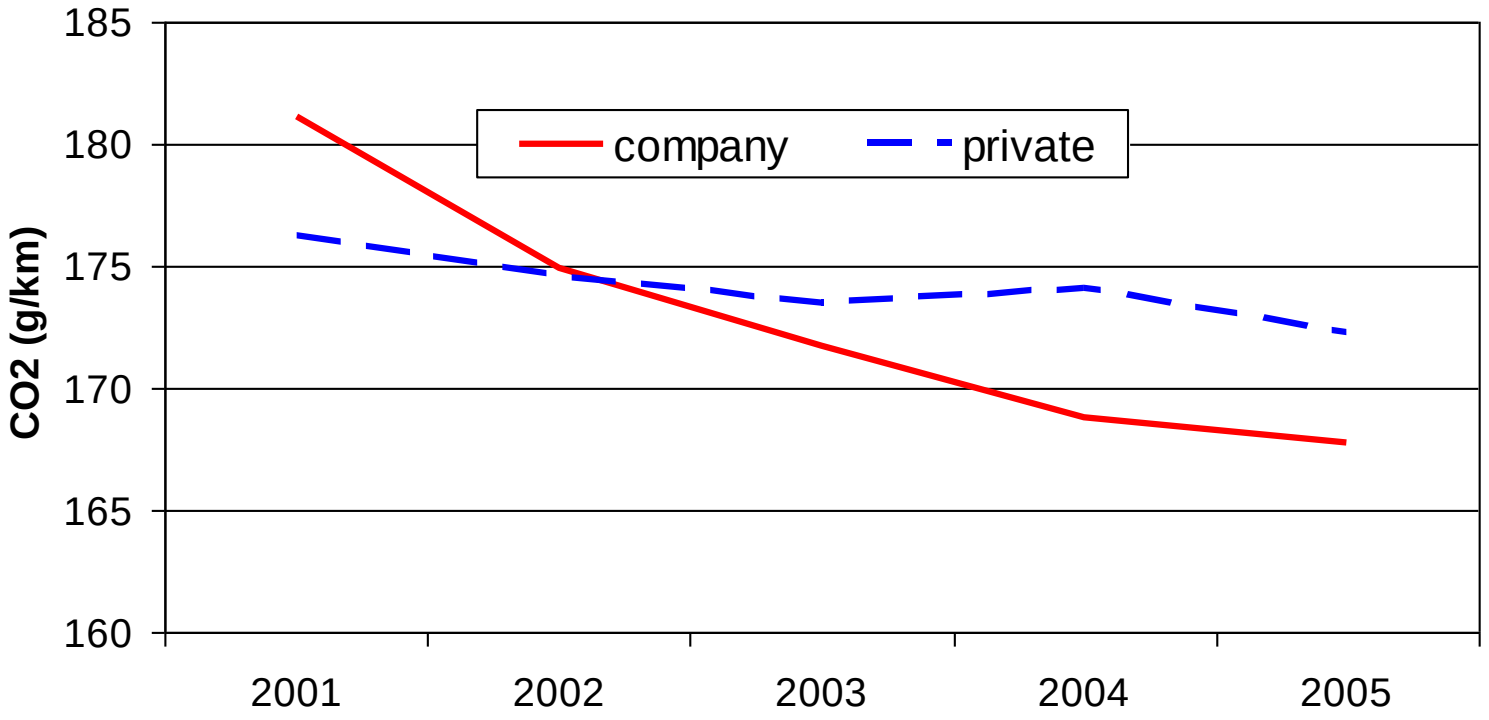
Source: DfT,

Company car tax differentiation in the UK



Source: DfT,

Impact of UK tax differentiation



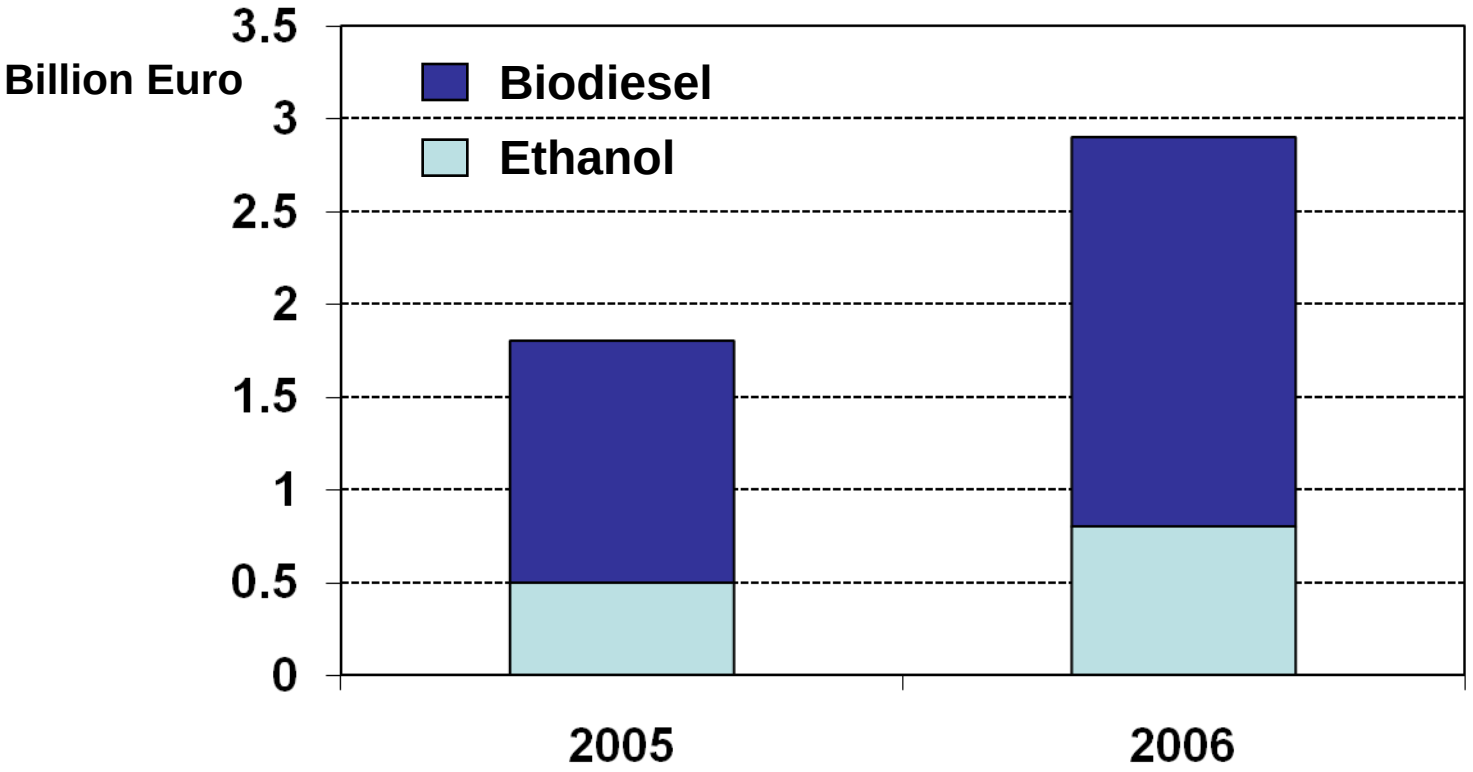
Source: DVLC

High cost GHG mitigation: Biofuel subsidies

Average performance	Euros/tCO_{2eq}	USD
US corn-ethanol	390	520
EU sugar-beet ethanol	450—620	610—840
EU rapeseed biodiesel	750—990	1 000—1 340

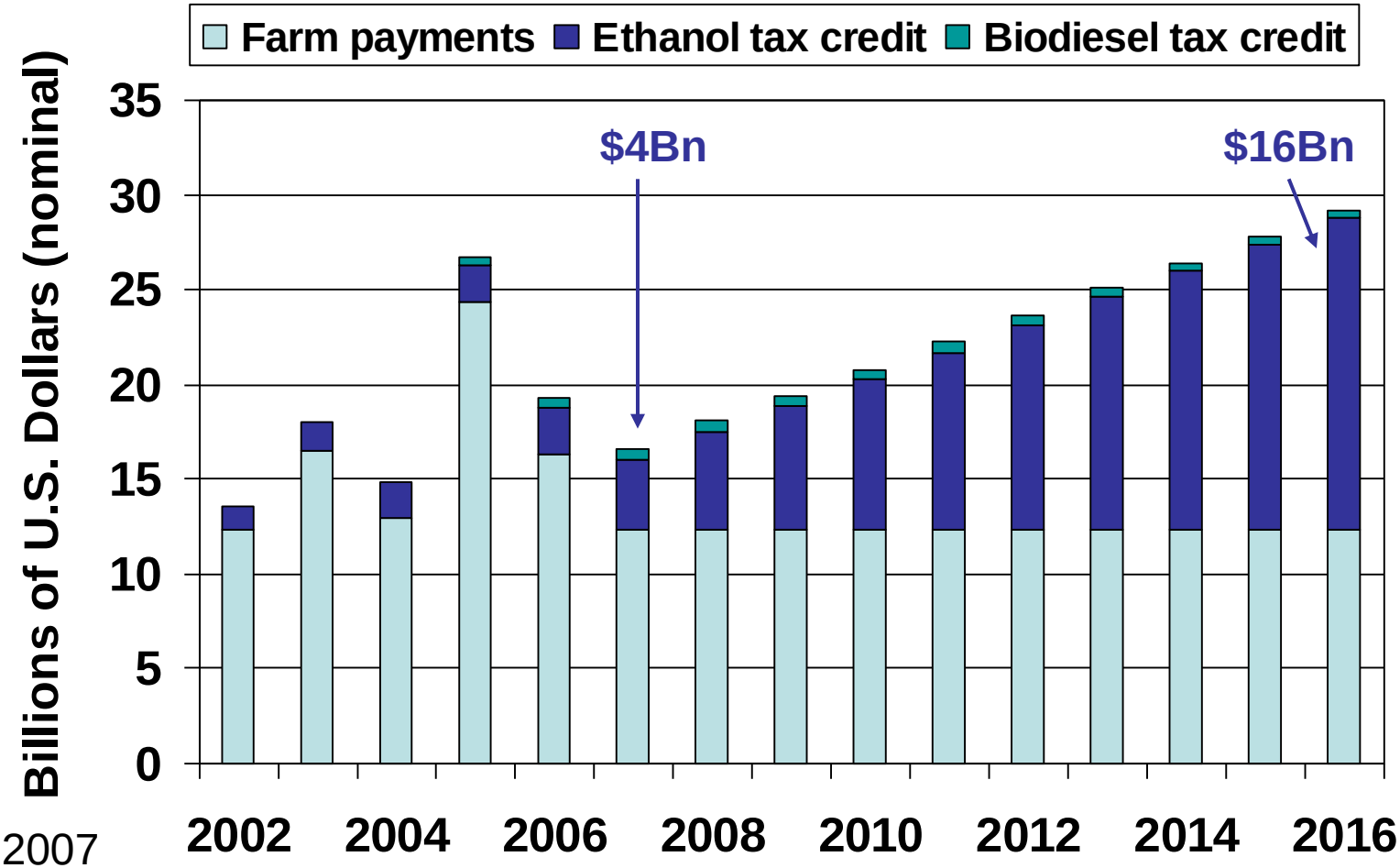
Sources: Koplow 2007; Kutas *et al.,* 2007.

Biofuels: EU tax subsidies increasing rapidly
(Excise tax exemptions - revenue loss)



Sources: Koplow 2007; Kutas 2007; for GSI

US biofuel tax subsidies to grow and grow



GSI 2007

Biofuels GHG emissions balance

- Wide range of uncertainty in the estimation of life-cycle GHG emission balances;
- Farming practice can shift the balance from positive to negative;
- Oxidation of soil carbon and emissions of N_2O from fertiliser application are big sources of GHG emissions.

Designing support for biofuels

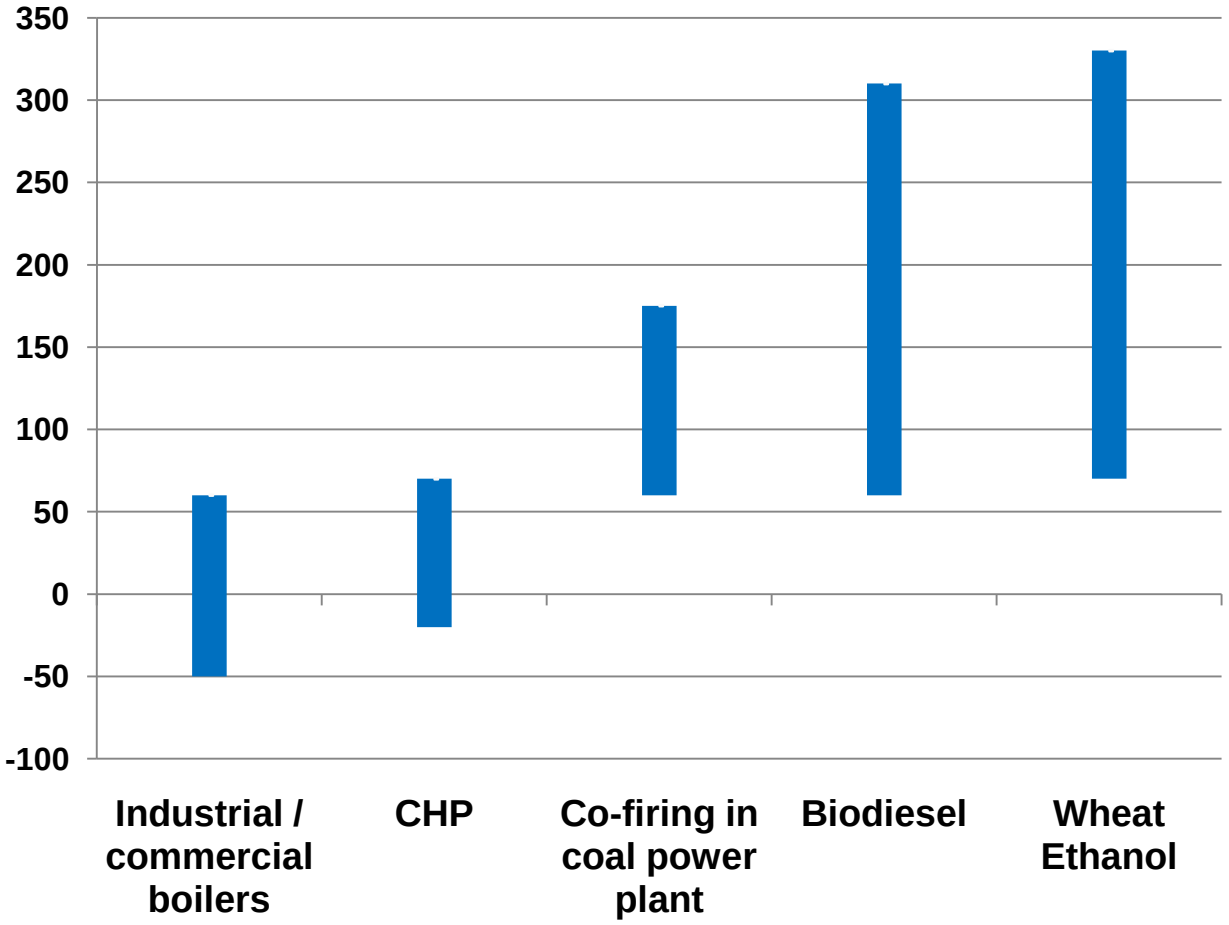
- Volumetric targets inappropriate
  - Likely to favour worst performing, lowest cost production
- Transport fuel carbon content targets better
- Certification for biofuels production
  - Should improve outcomes even if it is difficult
  - Not suited to indirect effects – forest destruction
  - Requires extensive stakeholder consultation
  - Crude system better than no certification

… designing support cont.

- UK, NL, Germany, Switzerland, California, EU developing certification to regulate market
- Range and poor performance of today's biofuels partly result of absence of regulation or incentives linking support to CO_2 balance
- Fuel carbon taxes, including for biofuels, would be more cost-effective than subsidies or targets

Biomass better for heat and power

£ / tonne CO_2 abated



Source: Dti

Policy package

- Integrated packages of measures needed
  - Vehicles, fuels, demand mgmt, modal shift
- But vehicle efficiency measures deliver most
- Off-cycle components and eco-driving are most cost-effective
  - Large, immediate savings – should be core measures
  - Switch attention to efficiency, away from fuels & modal shift co-benefits approach (currently 1/3 of all national policies reported)

Priorities

- Differentiate vehicle taxes by CO_2
  - More countries
    - In EU, no need to wait for Directive
  - stronger incentives
    - Linear incentives to avoid fragmenting car market
- New low cost efficiency measures
  - Off-test vehicle component standards / incentives
    - tyres, lights, air conditioners, lubricants.
  - On-road efficiency
    - driving style training / instruments

References:

- www.cemt.org
  - Environment pages
  - Research Centre pages
- www.internationaltransportforum.org