Offshore Europe 2013
Oil and Gas Conference and Exhibition
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Aberdeen | UK

The future of road transport fuels

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Low Carbon Vehicle Partnership

LowCVP
low carbon vehicle partnership

Society of Petroleum Engineers
SPE International

LowCVP at SPE conference??

- The LowCVP is a Public / Private partnership formed in 2003 with a cross – government mission.
- ***"To accelerate a sustainable shift to low carbon vehicles and fuels in the UK and thereby stimulate opportunities for UK businesses"***

- Unique collaboration of oil and energy (fossil and bio) , Automotive supply, manufacture and operator, Environmental groups, research and academic institutions, consultants and national and local government

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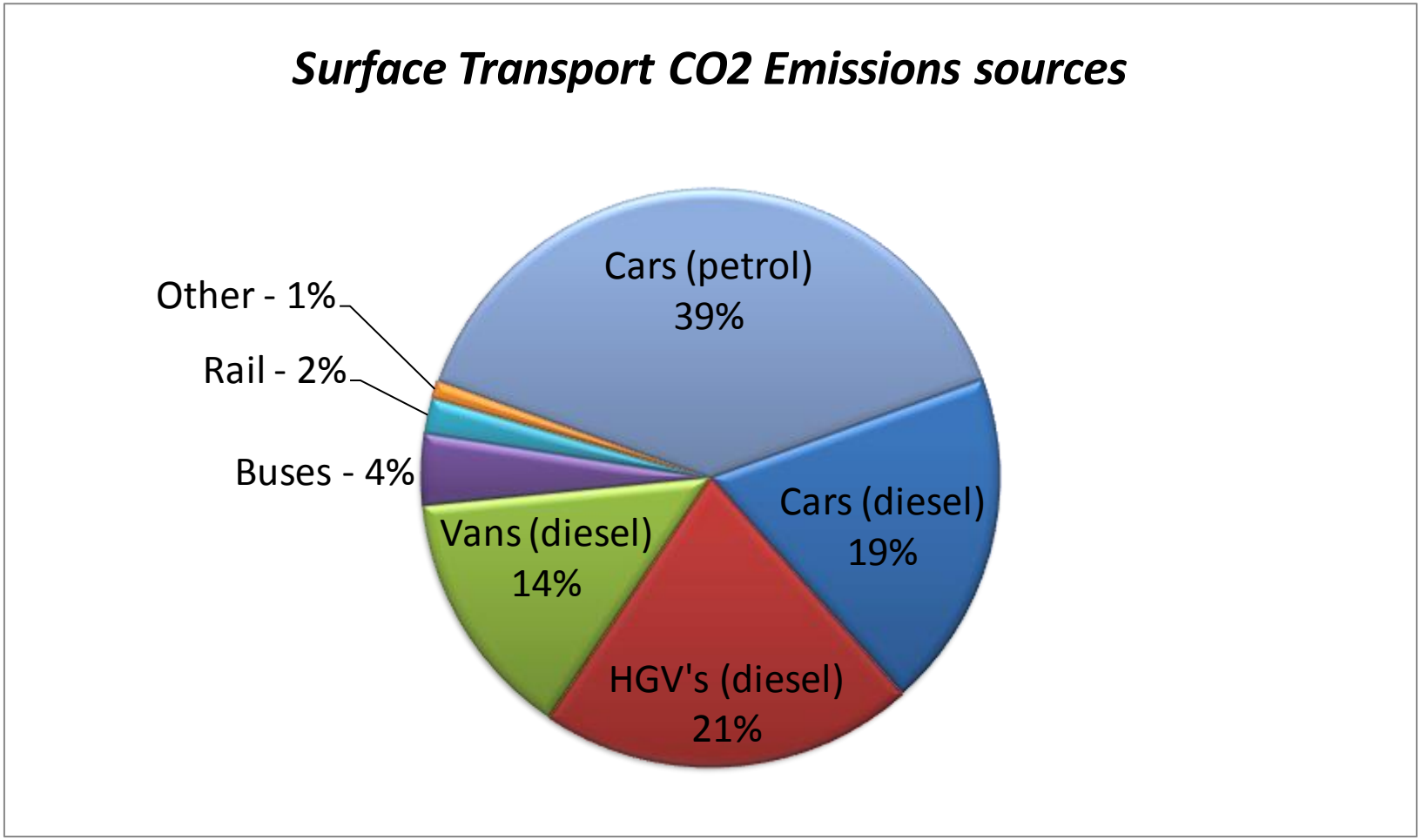
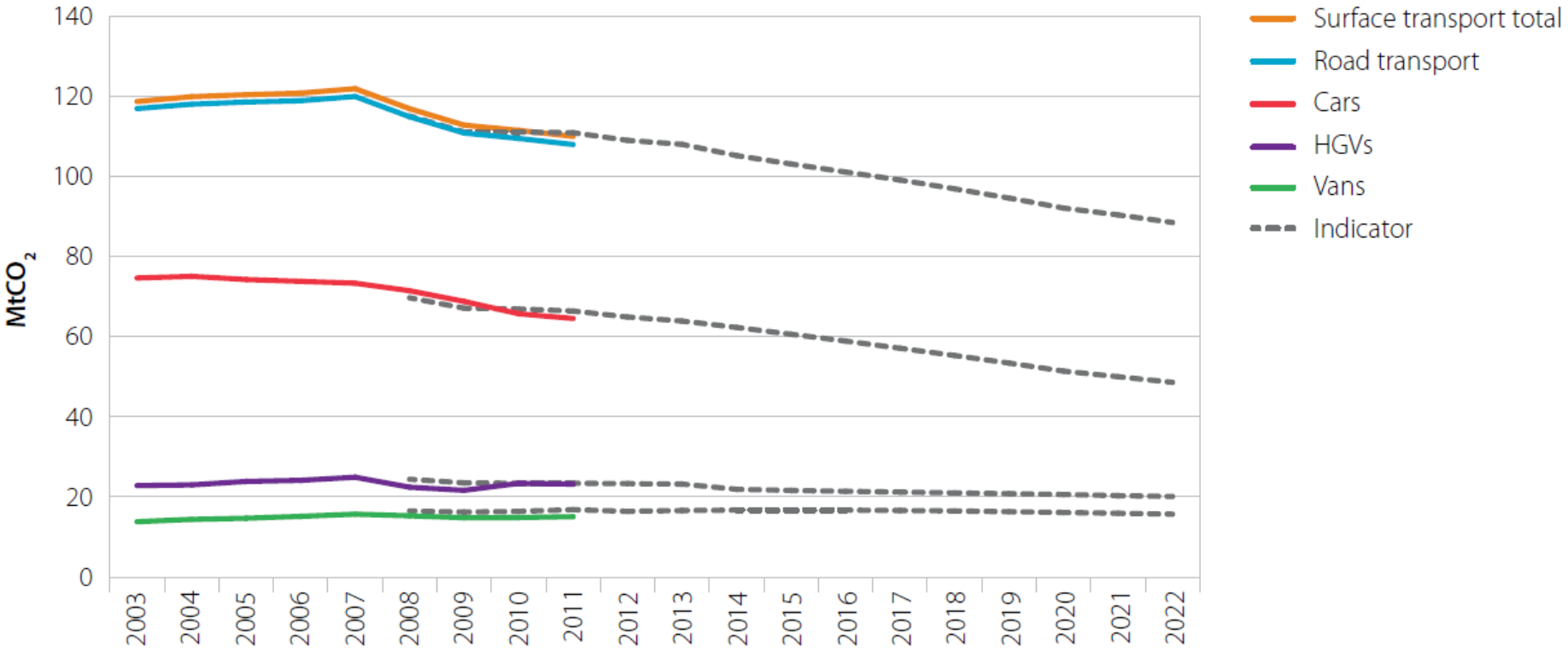
Petrol and diesel currently account for the vast majority of surface transport emissions (99.7% in 2011).

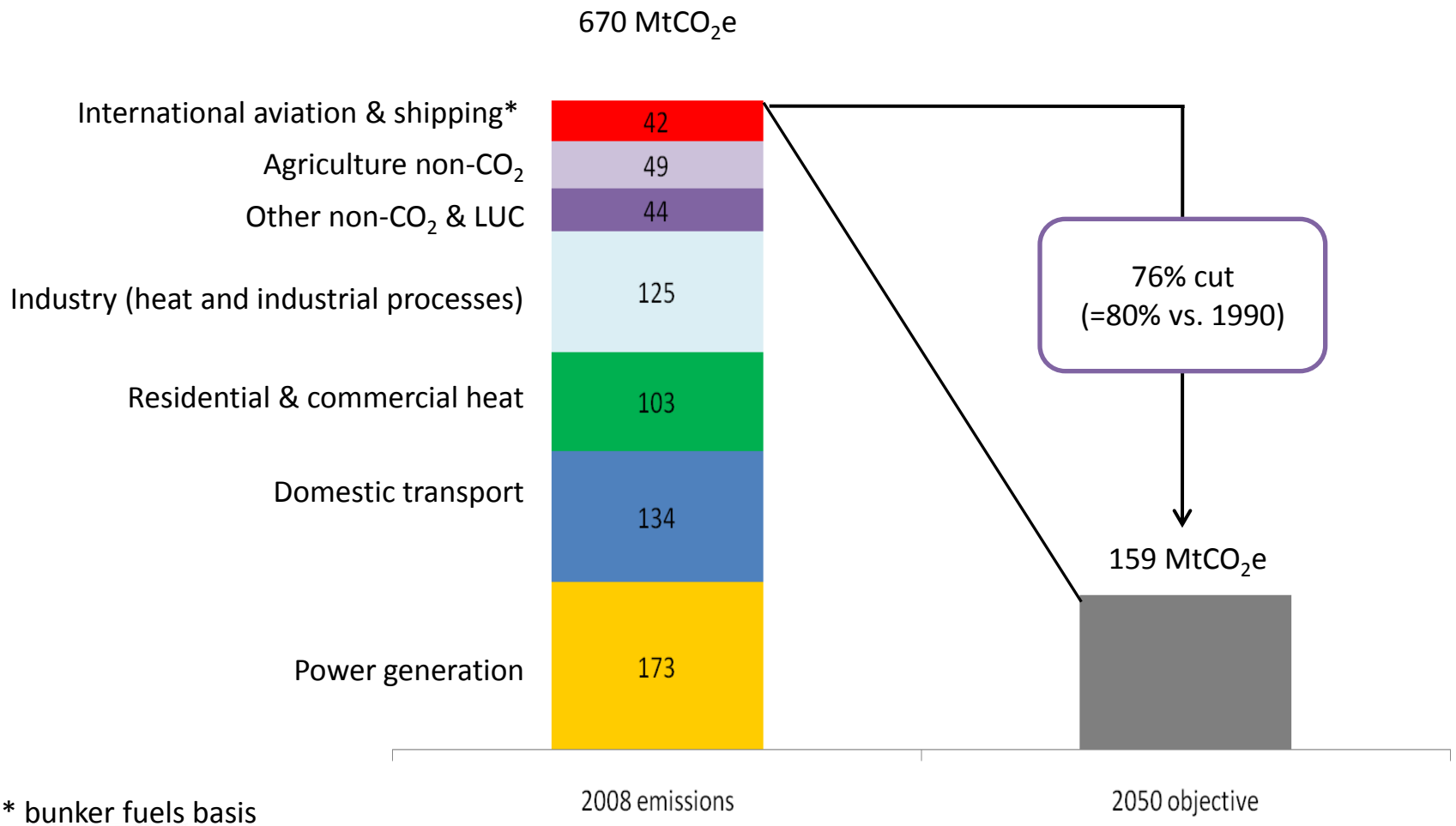


Surface transport emissions fell by 1.3% in 2011.

(source CCC)



The UK's 2050 target is challenging
(source CCC)

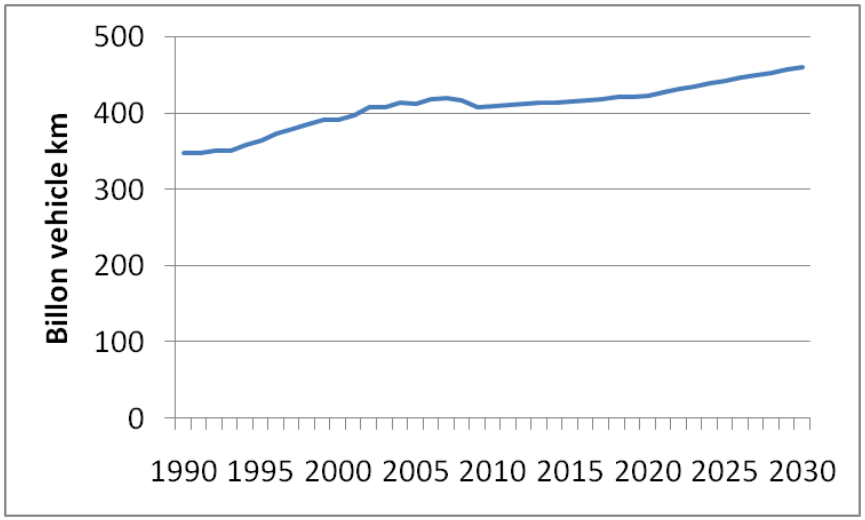


* bunker fuels basis

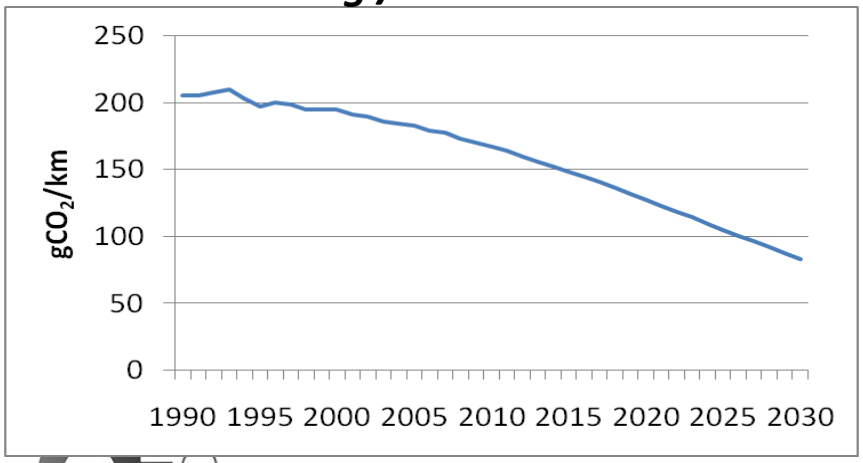
Transport: Emissions reduction will come from reducing g/km, while km likely to increase

(Source CCC)

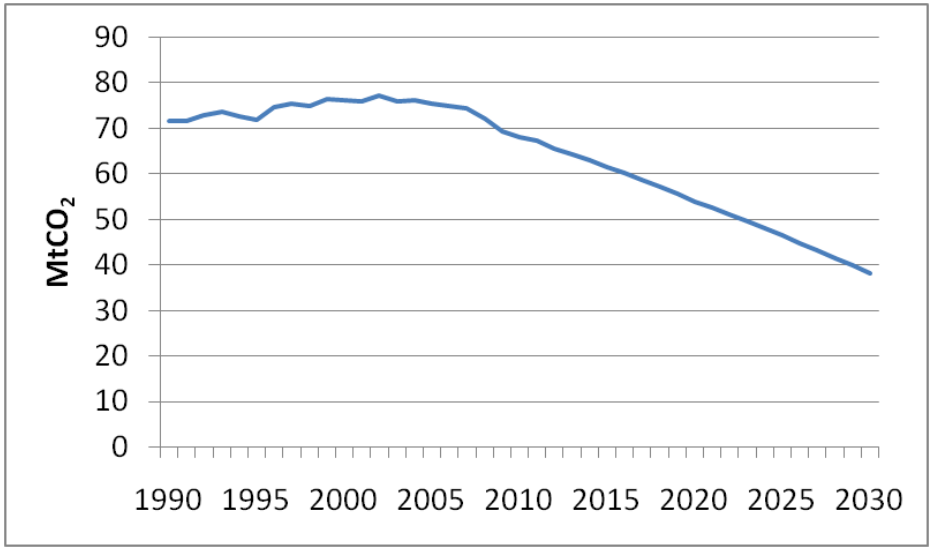
Car km



Car g / km



Car emissions

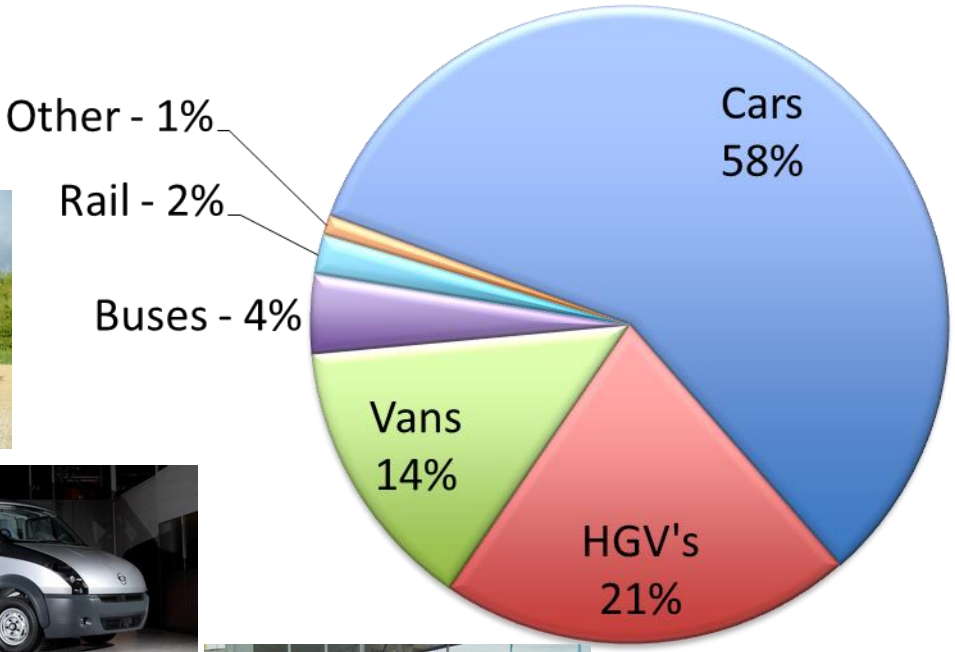


Vans: 17% emissions reduction to 2030

HGVs: 33% emissions reduction to 2030

A wide range of innovative vehicle technology options to reduce carbon are emerging on the market

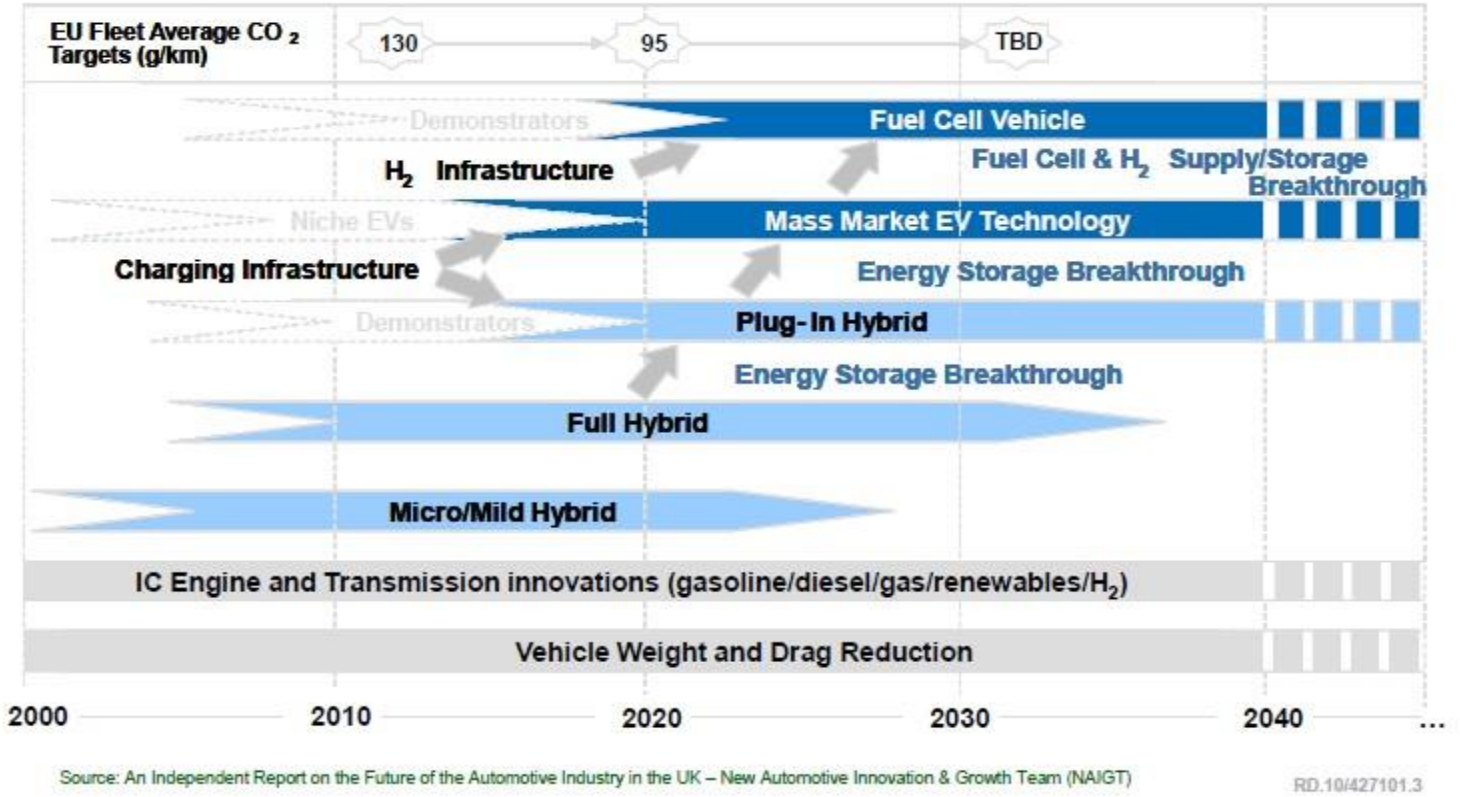
Core progress made through improvements in vehicle efficiency and with low blend Biofuels



Automotive industry agree the general trajectory and challenges

automotive council UK

Individual manufacturers will prioritise certain technologies to fit with brand values, but OEMs share a common view of a high level Technology Roadmap



Source: An Independent Report on the Future of the Automotive Industry in the UK – New Automotive Innovation & Growth Team (NAIGT)

RD.10/427101.3

Penetration of technology is slow

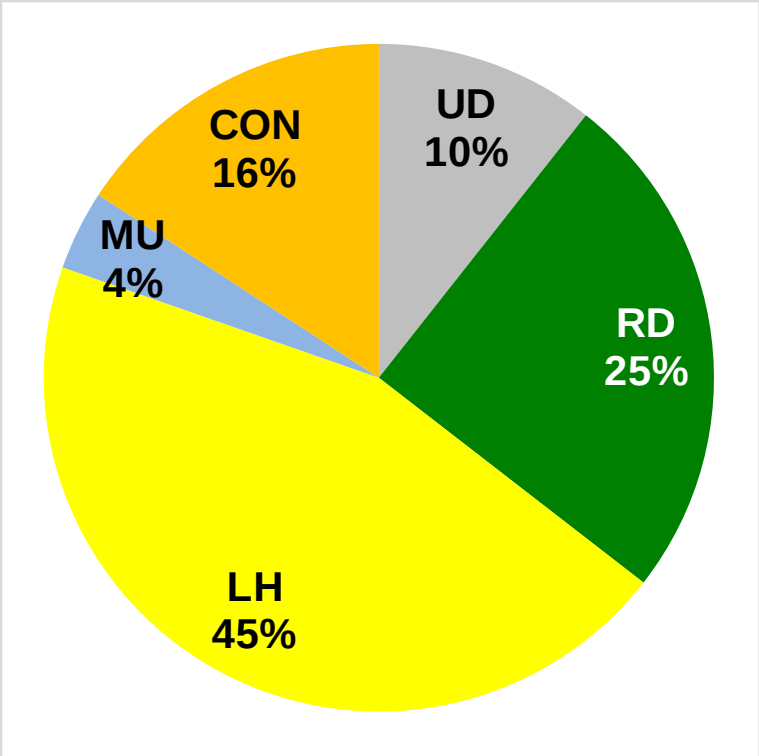
SMMT Motor industry facts 2013

- New technology is a key carbon reduction strategy (eg new car CO2 progress, EV's)
- Annual sales of new vehicles as percentage of road fleet:- - average sales % over last 10yrs
  - Cars 7.3%
  - Vans 8.2%
  - Trucks 8.5%
  - Bus 4.1%
- Existing vehicles will remain in the fleet for many years and fuel must remain compatible
- Sales of plug-in cars doubled in 2012 but were just 2254 in a new car market of over 2M (and total fleet of 31.5M)

Decarbonising Road Freight – the opportunities

- Research on behalf of DfT
- Joint report published 3rd Dec '12
- LowCVP/Transport KTN/SMMT
- Supported by Industry bodies
  - CiLT
  - FTA
  - RHA

Where does the HGV CO2 come from



Ranking of duty cycles by CO_2 emissions share:

1. **LH Long haul (44-46 %)**
2. **RD Regional Delivery (24-25 %)**
3. **CON Construction (15-16 %)**
4. **UD Urban Delivery (10-12 %)**
5. **MU Municipal Utility (4 %)**

The ranges indicate the variation due to low, central and high distance estimates.

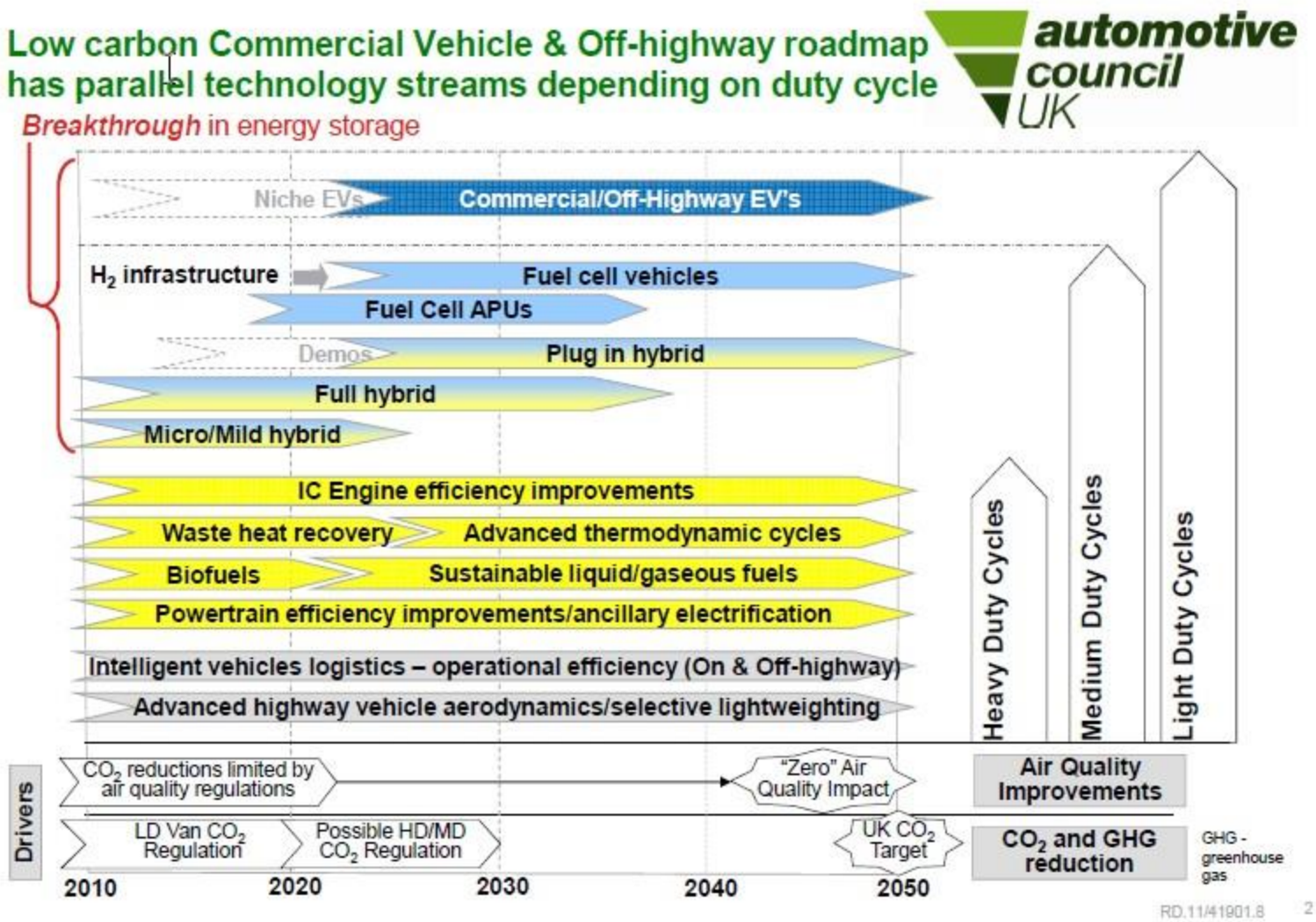
70% of fuel is used in Long Haul and Regional Delivery operation in Larger Trucks

Recommended technologies & fuels

	Technology / fuel	Applicable duty cycles	Total UK HGV WTW CO_2e saving potential*	Additional considerations
1	Dedicated natural gas engines	All	5-16% (methane) 61-65% (biomethane)	Significant particulate emission & noise reduction benefits. CO_2 reduction benefit substantially greater when running on biomethane.
2	Dual fuel engines	Long haul, regional delivery and construction	13% (methane) 33% (biomethane)	Some particulate emissions & noise reduction benefits when running on gas. Payback and CO_2 savings very dependent on gas substitution rates (higher for higher speed duty cycles). CO_2 reduction benefit substantially greater when running on biomethane.
3	Aerodynamic improvements	Long haul, regional delivery and construction	5-6%	Benefits dependent on correct fitting / adjustment / average duty cycle speeds. Does not suit some body types / operations.
4	Pure electric vehicles	Urban delivery	5%	Highest local air quality and noise reduction benefits. Lifecycle impacts of batteries need to be considered. Currently maximum available GVW is 12 tonnes.
5	Hybrid electric / hydraulic hybrid / flywheel hybrid vehicles	Urban delivery and municipal utility	3-4%	Air quality and noise reduction benefits particularly if able to run in electric only mode. Lifecycle impacts of batteries need to be considered. Flywheel hybrids are not yet commercially available, but are expected to offer a lighter weight and possibly lower cost alternative to battery-electric hybrids.
6	Low rolling resistance tyres / single wide tyres	All	1-5%	Lower rolling resistance tyres are available for all duty cycles. May have slightly shorter lifespan than standard tyres but CO_2 savings expected to outweigh any negative environmental impact.

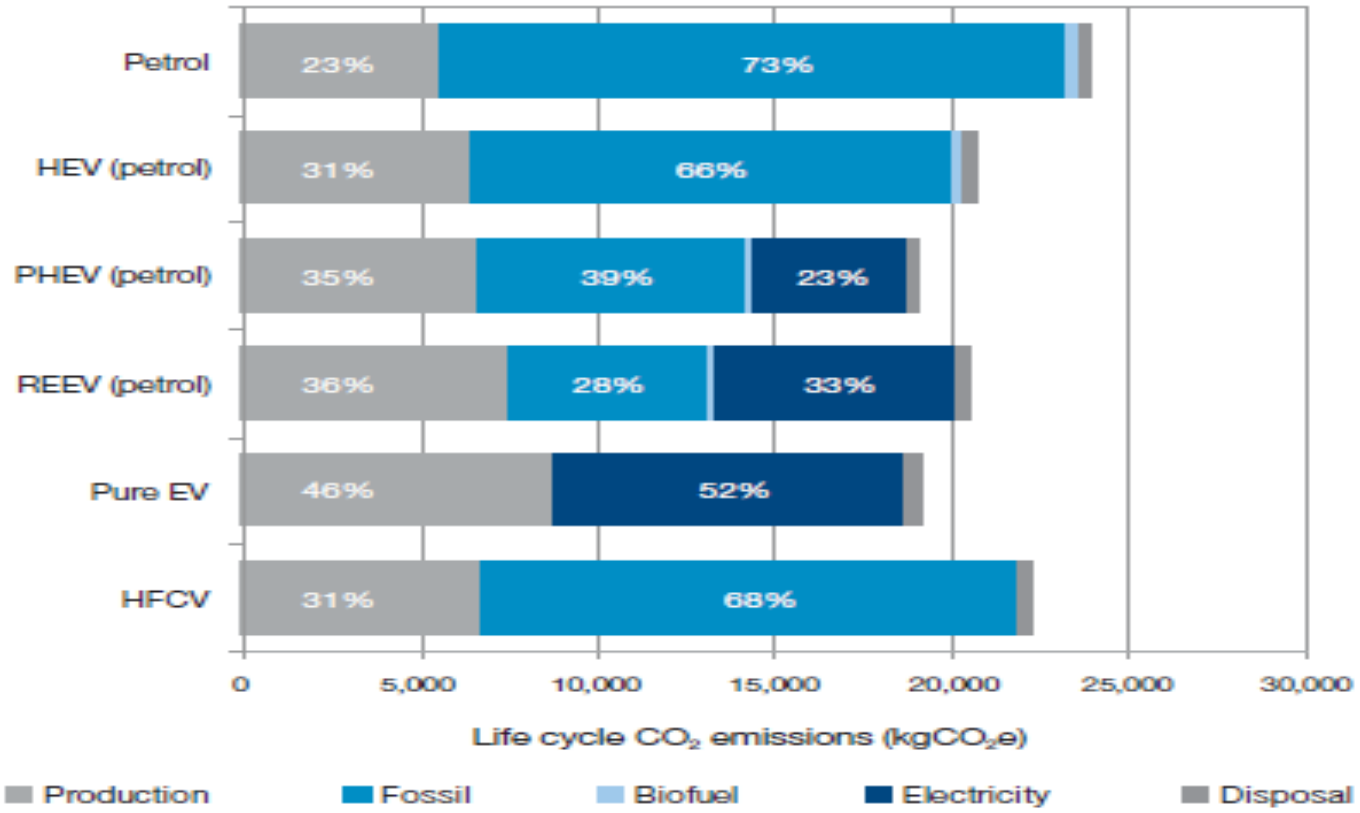
*The overall % saving of total UK HGV CO_2 emissions if technology/fuel applied to all relevant vehicles/duty cycles.

Road Freight road map increases complexity



The way we measure carbon impact needs to change in 2011 – LowCVP highlighted technology variations

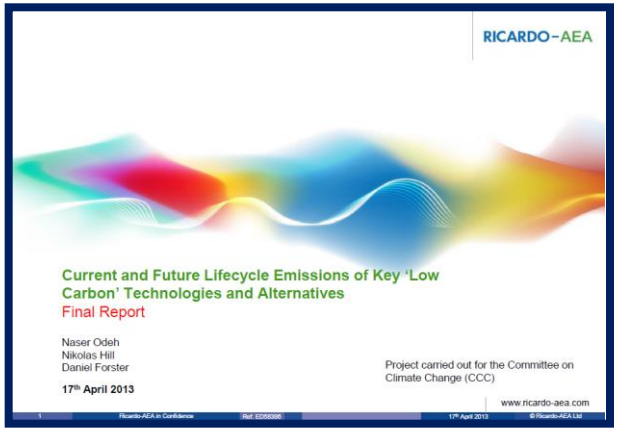
Figure 2.4: Life cycle CO_2e emissions for various medium-sized vehicle technologies in 2015

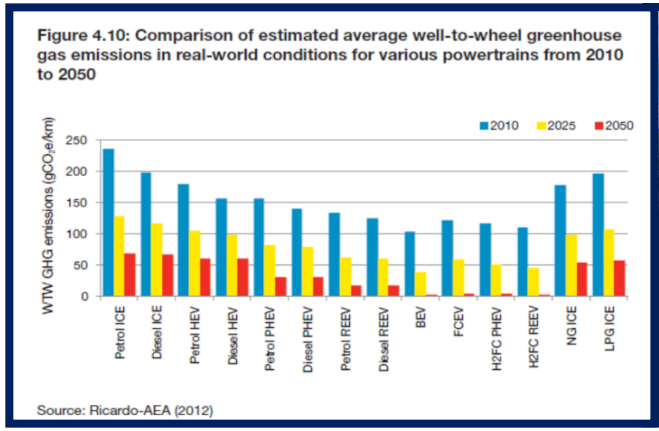


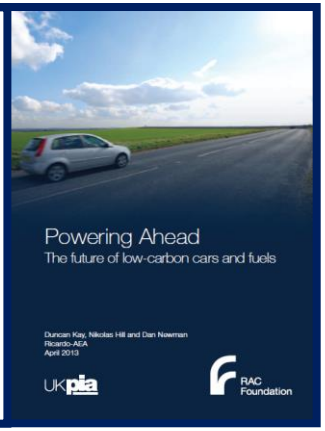
Source: Ricardo (2011)

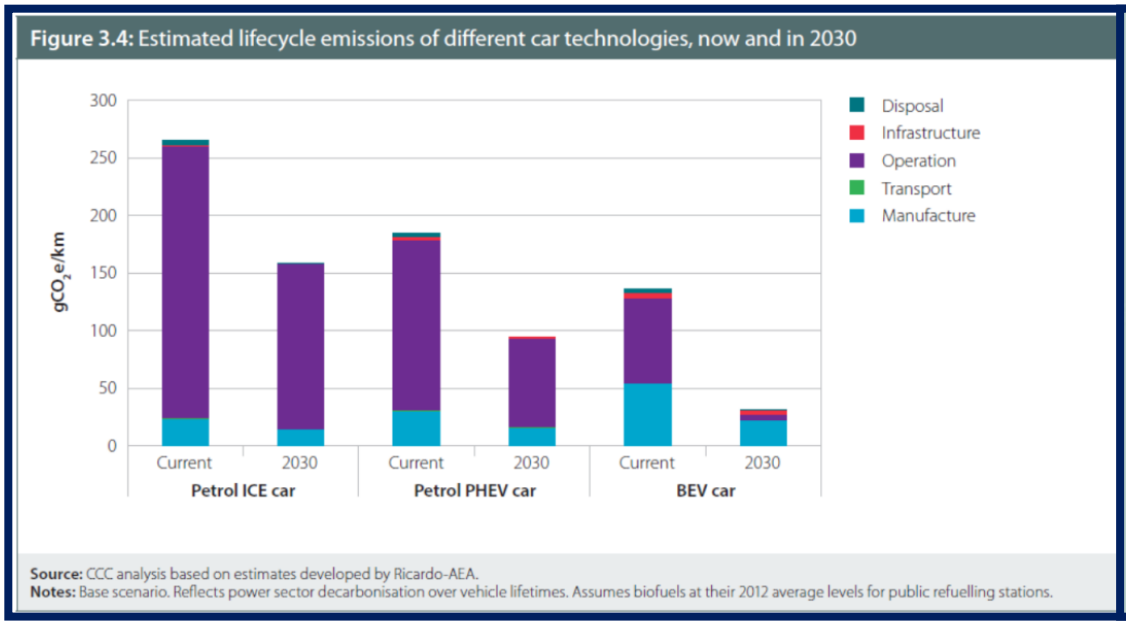
Preparing for a Life Cycle CO_2 Measure – Report for LowCVP 2011

In 2013 – LCA analysis gathers momentum









LowCVP Report 2013 on Life Cycle assessment

Building on the previous LowCVP work:-

- To study how the change in technology will affect the life-cycle impact
- To identify the most carbon intensive phases of a vehicle life now and in the future
- To review key areas of sensitivity in input assumptions

- Considers four technology options
- (Petrol only) ICEV, HEV, PHEV, BEV
- From 2012, forecast for 2020, 2030
- Identifies potential of ‘best’ case options

Manufacturers and legislators in harmony?

The shared agenda

- European Union recommendation 2013/179/EU
  - Developing the principles for Product Environmental Footprint (PEF)
    - Note this excludes ILUC consideration!


4.5.2013 EN Official Journal of the European Union L 124/1

II

(Non-legislative acts)

RECOMMENDATIONS

COMMISSION RECOMMENDATION

of 9 April 2013

on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations

(Text with EEA relevance)

(2013/179/EU)

- SMMT 14th year of Sustainability Report
  - Energy and resources used in production
  - Year-on-year reductions
  - Covers over 95% of UK production
  - Includes Tier 1 suppliers

- Manufacturers' individual reports on LCA and sustainability

BUT … real world fuel use higher than NEDC

Recent reports have noted that consumers fuel consumption typically exceeds test cycle results by an average of 25%

- ICCT report May 2013 –25% average increase based on users own data input
- Emissions Analytics/WhatCar? True mpg - 25% higher

Interestingly the results are very consistent even though some data are from a large dataset of users own fuel measurements and other from on-road testing using Portable Emissions Measurement System (PEMS)

BUT … Well-to-Wheel assessment is needed

No current options completely eradicate carbon from the fuel use chain, however all have significant opportunities to reduce carbon

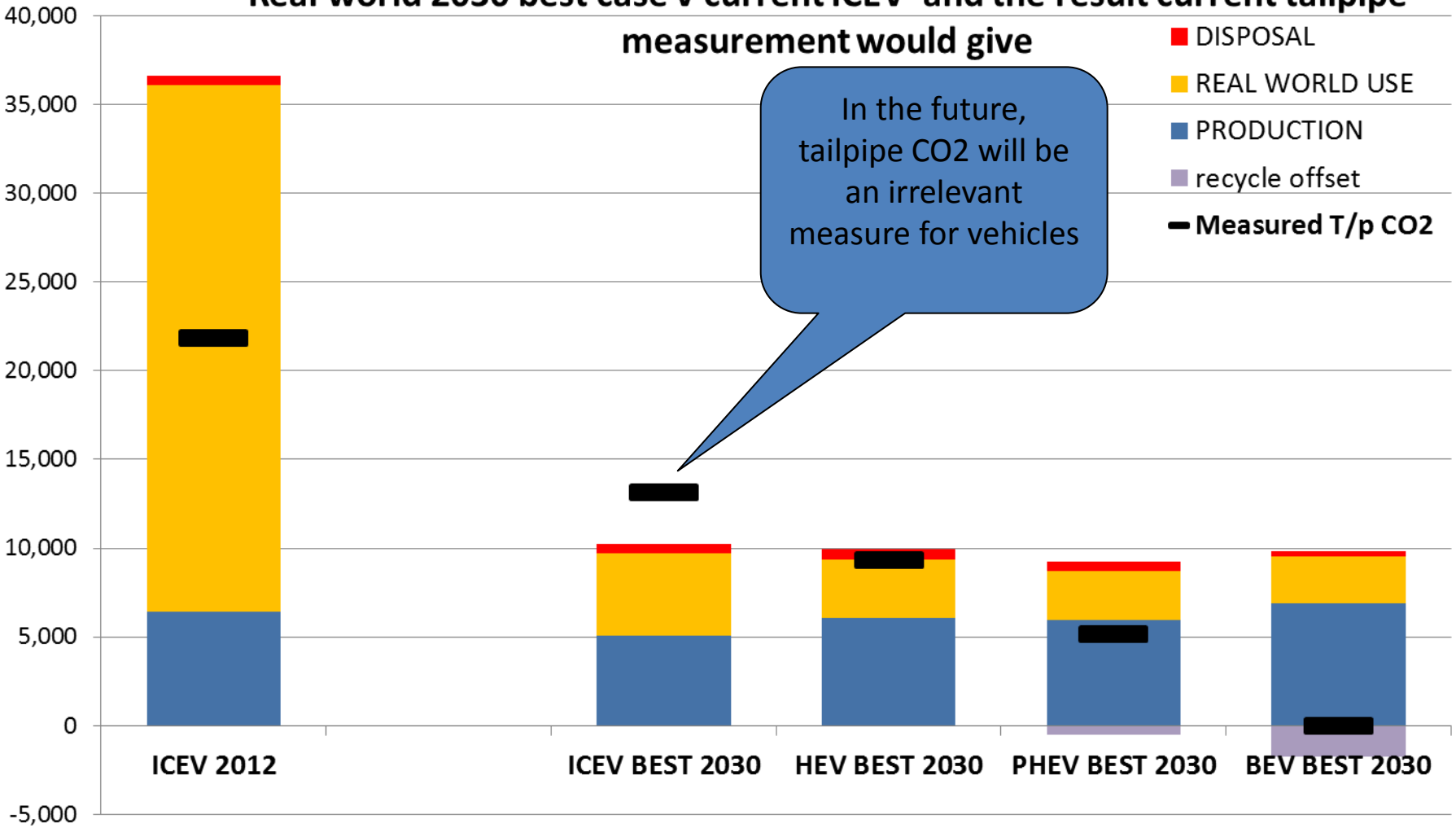
- Liquid fuels (petrol/diesel) – higher biofuel blends and substitution
- Electricity - renewables and the low carbon grid
- Gas – Biomethane
- Hydrogen – production from water electrolysis.

Only by combining a WTW approach **together** with in-use vehicle energy efficiency will the lowest carbon pathway for the use phase become apparent.

There is no single solution so keeping our options open allows optimum combinations and applications of transport energy pathways

Tailpipe CO_2 is no longer representative

Real world 2030 best case v current ICEV and the result current tailpipe measurement would give



A new transport energy infrastructure

- There are significant challenges over the energy infrastructure for transport.
- Currently transport and residential energy are discrete supply and infrastructure.
- Combining users energy demands to a single source has substantial implications.
- The cost and climate impact of a “new” transport energy infrastructure must be incorporated in the long term plans (recent proposals from Europe appeared to ignore this!)

Conclusions

Working in partnership, the UK has a great opportunity to lead the way in low carbon transport technology, but….

- Carbon reduction targets for 2050 are very challenging
- Energy used for transport will become increasingly diverse.
- There are still several significant technical challenges and opportunities in key applications/technologies.
- The “inertia” in the existing fleet means change in energy will be slow
- Electricity and Hydrogen offer low carbon solutions but both require renewable energy generation and costly infrastructure investment.
- True “life cycle analysis” of transport climate impacts is required and may modify the decisions or timing of technology pathways.
- Collaboration across all transport stakeholder industries is essential.
- We must bring the customer with us to make a sustainable shift.

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Thank You

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