

Initiatives for CO2 emissions reduction in Europe

**Presented to SAE Diesel Forum
31st August 2011**

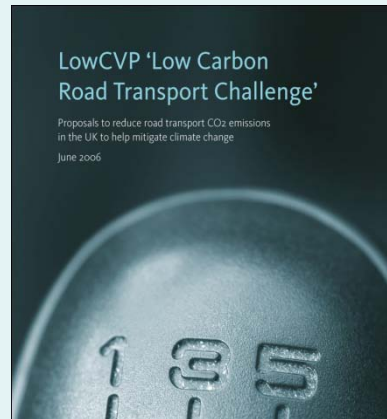
**Jonathan Murray
Low Carbon Vehicle Partnership**

Low Carbon Vehicle Partnership

Accelerating a sustainable shift to low carbon vehicles and fuels in the UK

Stimulating opportunities for UK businesses

LOWC^{VP}
low carbon vehicle partnership



LowCVP 'Low Carbon Road Transport Challenge'

Proposals to reduce road transport CO₂ emissions in the UK to help mitigate climate change
June 2006



Fuel Economy	Low Carbon Car												
<p>CO₂ emissions figure (g/km)</p> <ul style="list-style-type: none"> <100 A 101-120 B 121-150 C 151-180 D 181-210 E 211-240 F 241+ G 	B 117 g/km												
<p>Fuel cost (estimated) for 12,000 miles</p> <p>VED for 12 months</p>	<p>£662</p> <p>£50</p>												
<p>Environmental Information</p> <p>A guide on fuel economy and CO₂ emissions which contains data for all new passenger car models is available at any point of sale free of charge. In addition to the fuel efficiency of a car, driving behaviour as well as other non-technical factors play a role in determining a car's fuel consumption and CO₂ emissions. CO₂ is the main greenhouse gas responsible for global warming.</p>													
<p>Make/Model: Low Carbon Car</p> <p>Fuel Type: Diesel</p>	<p>Engine Capacity (cc): 1396</p> <p>Transmission: 5 speed manual</p>												
<p>Fuel Consumption:</p> <table border="1"> <thead> <tr> <th>Drive cycle</th> <th>Litres/100km</th> <th>Mpg</th> </tr> </thead> <tbody> <tr> <td>Urban</td> <td>5.4</td> <td>53.3</td> </tr> <tr> <td>Extra-urban</td> <td>3.8</td> <td>74.2</td> </tr> <tr> <td>Combined</td> <td>4.4</td> <td>64.2</td> </tr> </tbody> </table>		Drive cycle	Litres/100km	Mpg	Urban	5.4	53.3	Extra-urban	3.8	74.2	Combined	4.4	64.2
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Urban	5.4	53.3											
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Combined	4.4	64.2											
<p>Carbon dioxide emissions (g/km): 117 g/km</p> <p>Important note: Some specifications of this model may have lower CO₂ emissions than this. Check with your dealer.</p>													



LowC^{VP} marketing challenge

CARS NOT CARBON

A competition to promote a greener motoring marketing

Event outline

Winners to be announced at the LowCVP Annual Conference
28th June 2007
DTI Conference Centre, Westminster

Accelerating the shift to low carbon vehicles and fuels



LowC^{VP} Accelerating the Shift to Low Carbon Vehicles and Fuels

Home

- About LowCVP
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Latest news

LowCVP Annual Conference - 28 June - already announced!

Sign up to our email bulletin

Sign up our new member directory

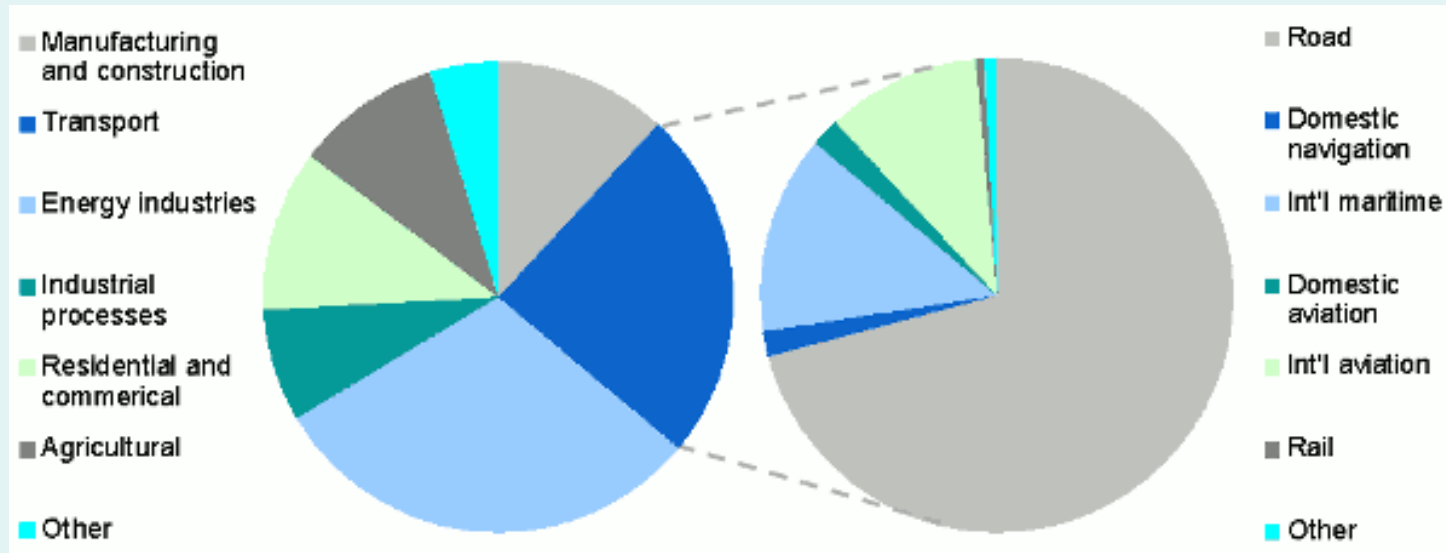
Sponsors and partners of Low Carbon Transport Research Centre

Overview

- ❑ Tackling climate change and the transport sector
- ❑ Pressure for fuel consumption improvement
- ❑ Fuel efficiency technologies in development
- ❑ The need for Government intervention
- ❑ Appropriate metric for fuel efficiency
- ❑ Categorising the HDV market
- ❑ Appropriateness of test cycles
- ❑ Alternative approaches to certification
- ❑ Proposed approach in Europe

EU is committed to reducing GHG emissions by 20% by 2020 compared to 1990

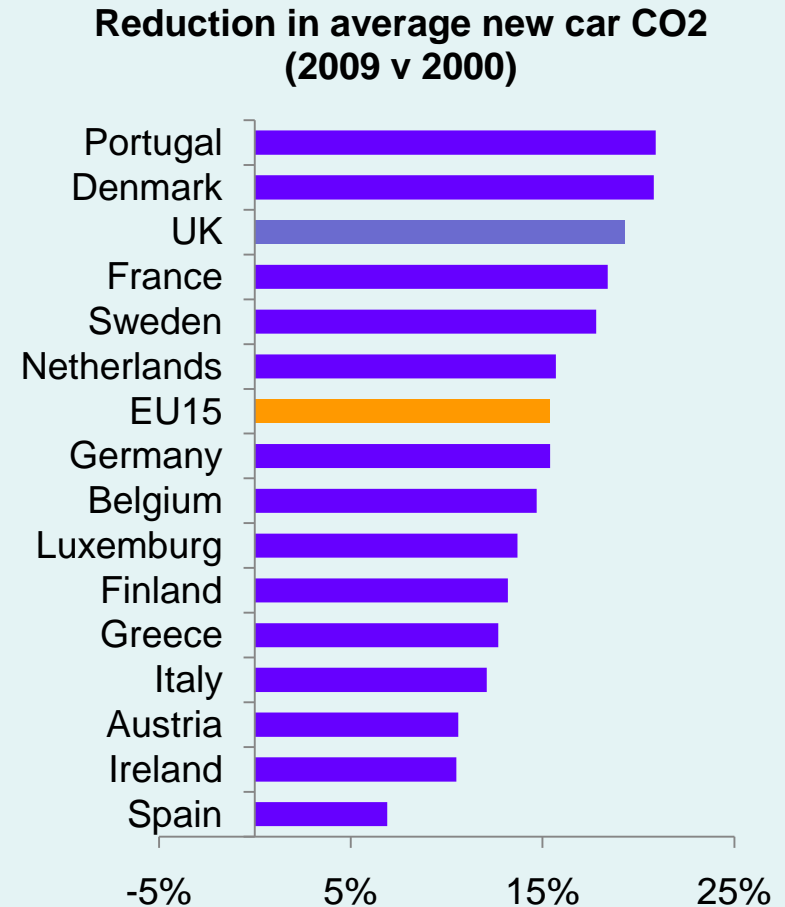
EU27 GHG emissions by sector and mode of transport, 2007



- ❑ Transport and particularly CO₂ emissions from road transport have been increasing since 1990
- ❑ In 2007 road transport accounted for 21% of man-made CO₂ emissions.
- ❑ HDVs account for 26% of total road transport CO₂ emissions
 - 85% from trucks, the remainder from buses and coaches
- ❑ HDV CO₂ emissions projected to grow by 15% by 2030

European Commission has tackled CO2 emissions from cars and LCVs through regulation to date

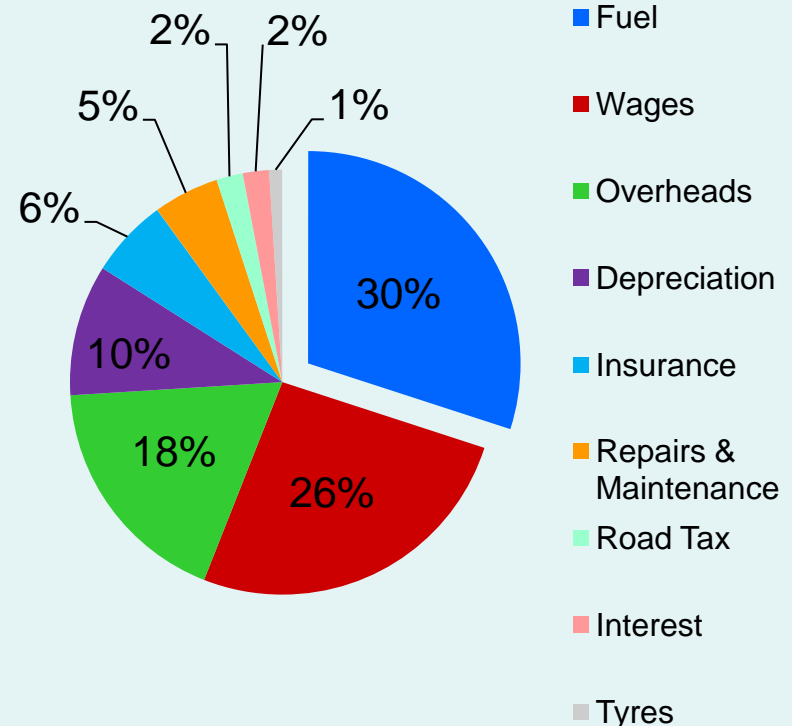
- ❑ The European Union regulation of new car CO2 emissions sets targets for average new car CO2:
 - 2015 target of 130g/km
 - 2020 target of 95g/km
- ❑ A similar approach has been taken for new LCV CO2 emissions with targets of:
 - 2016 target of 175g/km
 - 2020 target of 135g/km
- ❑ The targets are pan-European per manufacturer.



Customer demand should drive product development on fuel efficiency

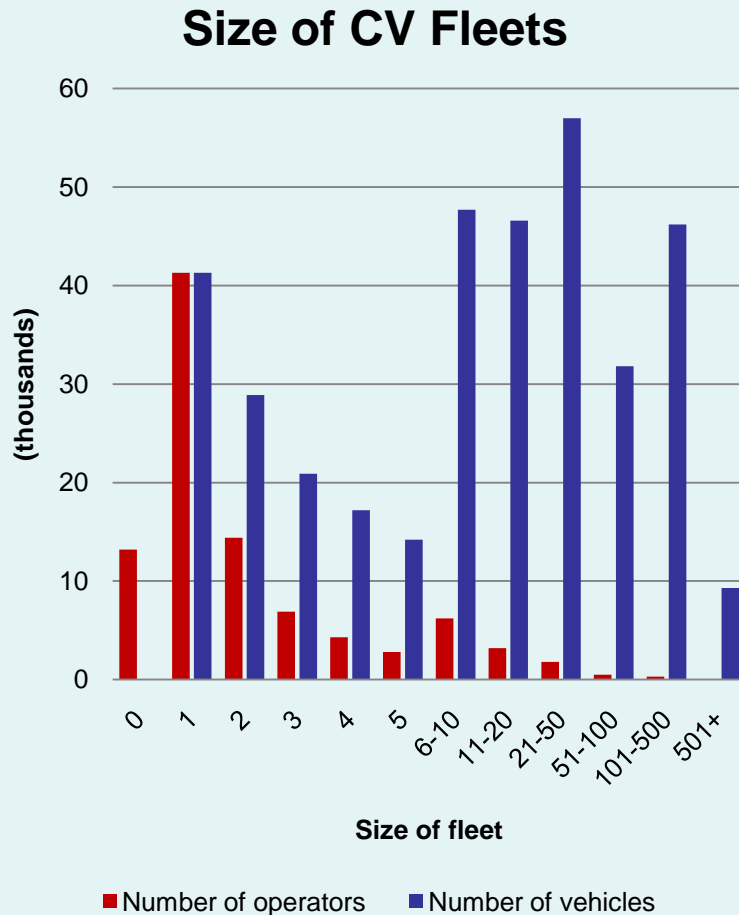
- ❑ European haulage industry is characterised by:
 - High fuel prices
 - High weights and volumes
 - Relatively long distances
- ❑ Fuel costs are a significant element of the operating costs of a haulage fleet.
- ❑ This should ensure pressure to drive fuel efficiency in operation and in HDV development.

Total Operating Costs



Based on 40 tonne tractor – semitrailer combination

47% of trucks are operated in fleets of less than 10 vehicles



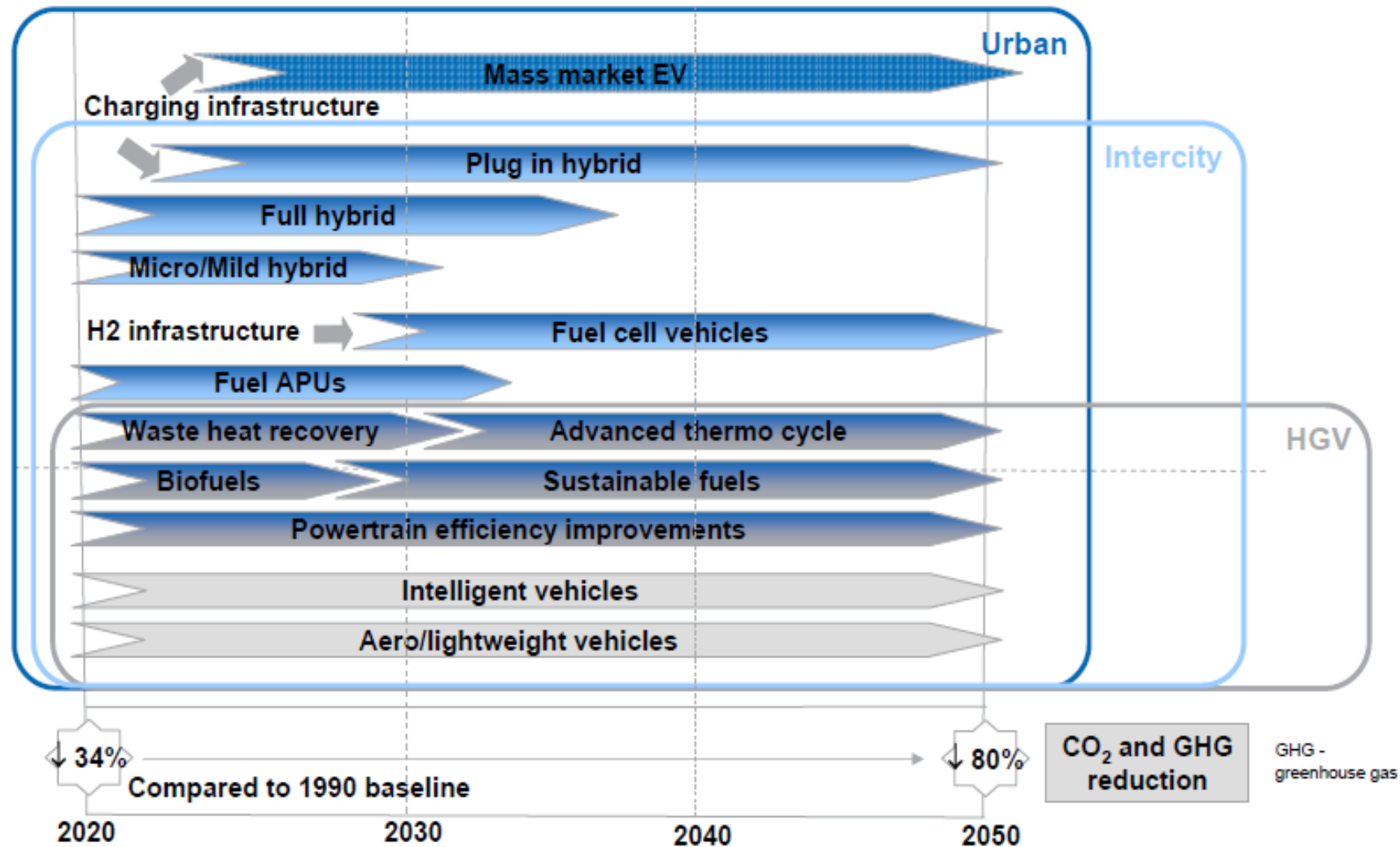
- ❑ Small and medium sized fleets play a vital role in haulage industry providing local and flexible transport sector. A major part of the truck market.
- ❑ Fleet operators lack confidence in manufacturer claims, and have expressed demand for independent certification.
- ❑ Small and medium sized fleet operators lack in-house engineering expertise.
- ❑ Haulage industry works on a low profit margins resulting in risk adverse approach to procurement.

Purchasing decisions of fleet operators don't deliver most fuel efficient vehicle fleet

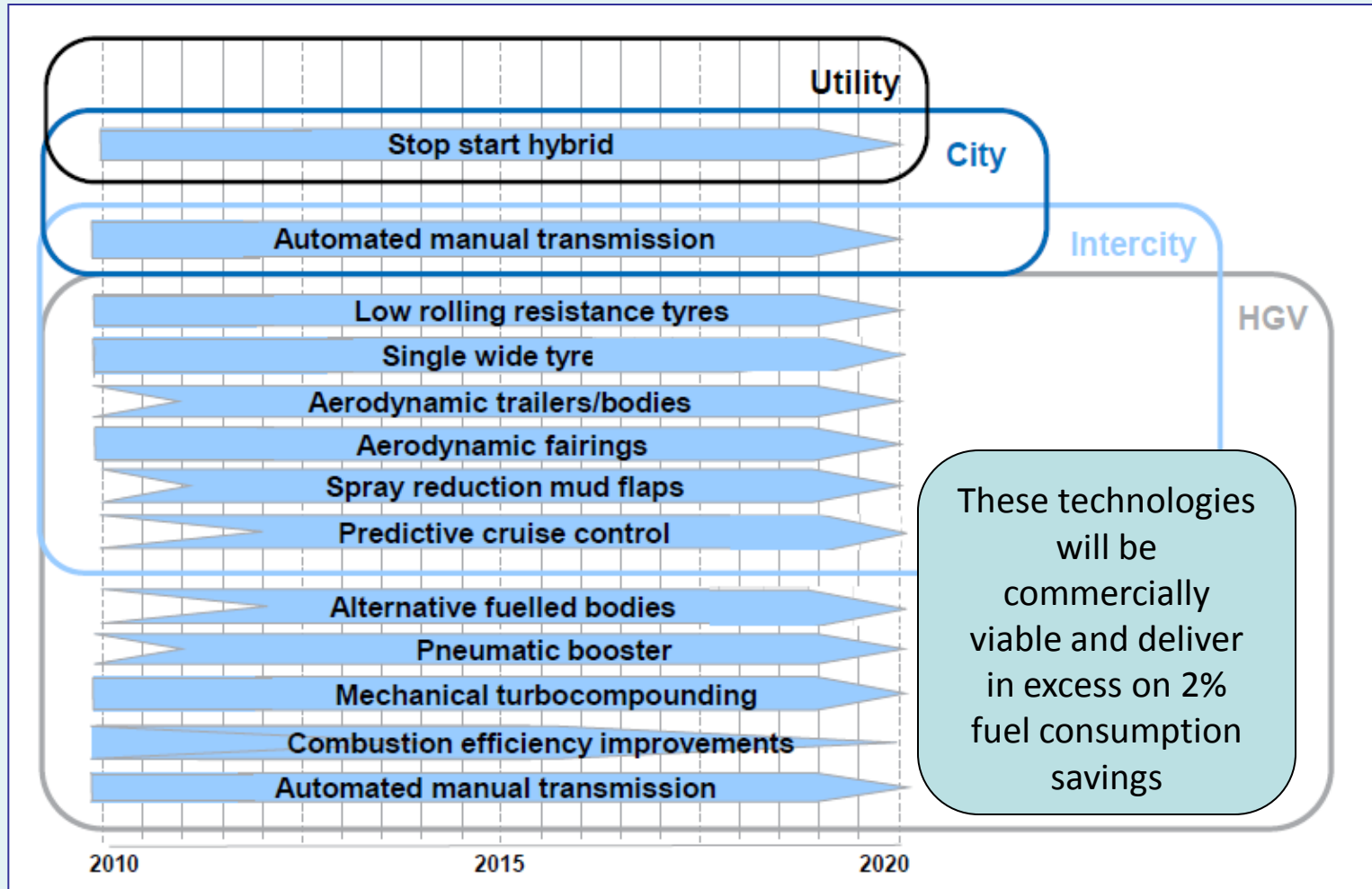


- ❑ Reliability and flexibility of vehicles and trailers has a greater impact on the profitability of a HGV fleet than fuel consumption.
 - Market failure to deliver fuel efficient HGVs.
- ❑ Fleet operators are very short term focused but purchasing decisions now will have an impact for at least a decade.
 - Policy instruments required now in order to deliver targets for CO2 reduction for the sector for 2020.
- ❑ Public sector controlled fleets are most in line with CO2 agenda but relatively small and specialised.

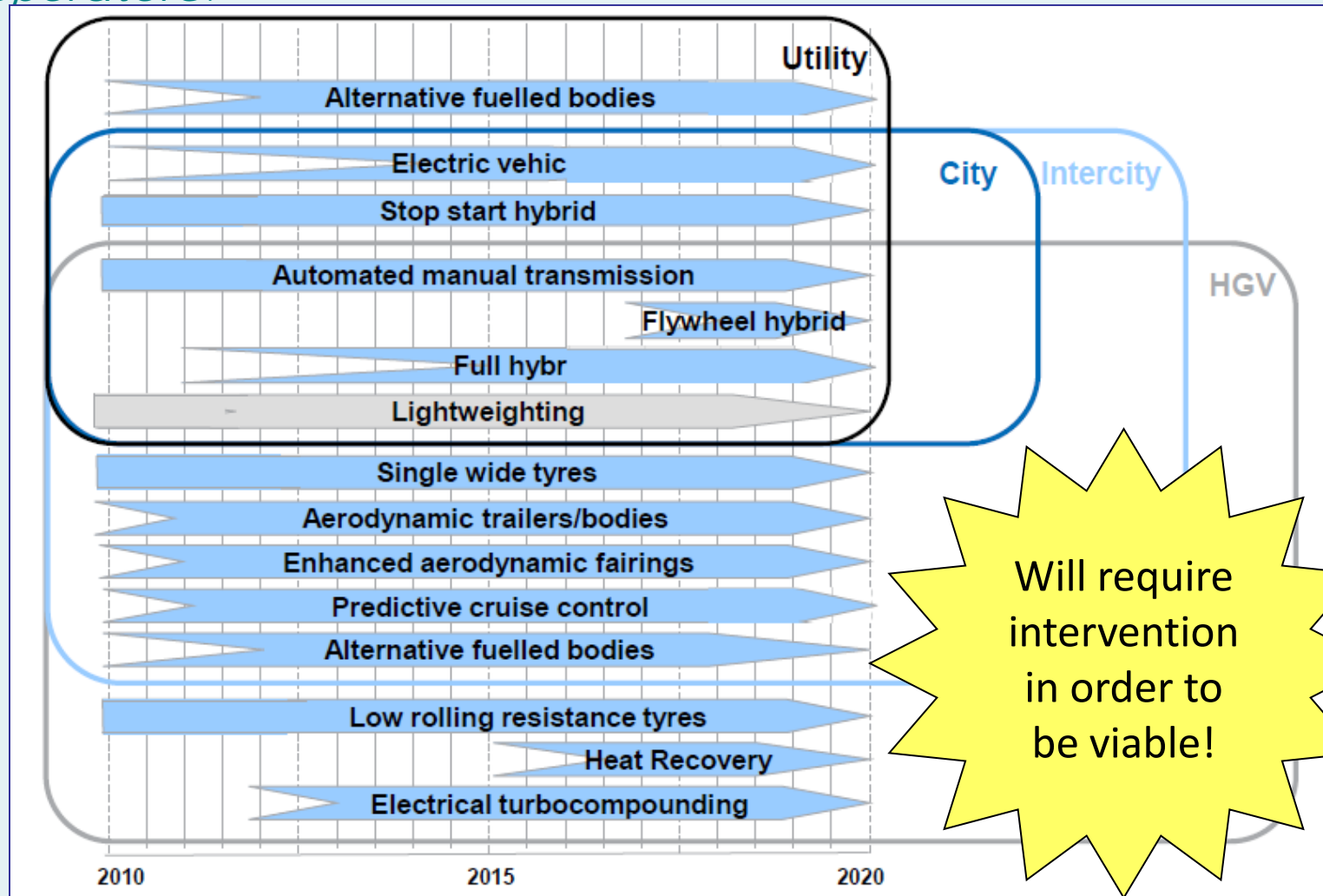
Long term low carbon roadmap incorporates a number of parallel technology streams which are application specific



There are a range of low carbon HDV technologies which have the potential to significantly reduce fuel consumption in this decade



But the majority of technologies do not provide a return on investment sufficiently quickly to be considered by fleet operators.



Need for Government intervention in the HDV market, called for by vehicle manufacturers

In order to ensure the haulage sector reduces CO2 emissions requires:

- ❑ Basis for comparing fuel consumption in operation.
- ❑ Certification of fuel consumption to provide confidence.
- ❑ Creation of market conditions to encourage technology deployment.

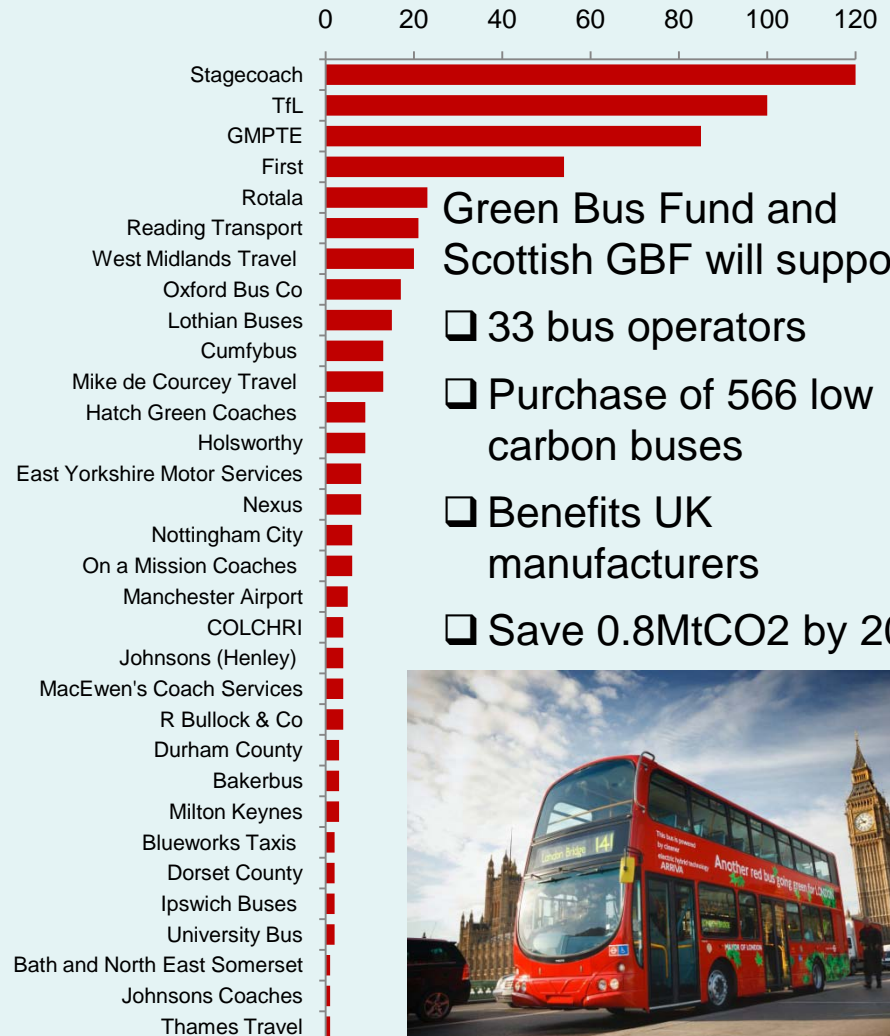
Global recognition and commitment to tackle issue from regulatory authorities and vehicle manufacturers



‘The world’s leading commercial engine and vehicle manufacturers are well aware of the importance of fuel efficiency to their customers and support global efforts to reduce GHG emissions. Global cooperation in developing specific requirements as well as metrics and methodologies to evaluate fuel efficiency, provides needed elements to further improve the environmental performance of our vehicles and increases the efficiency of goods transport. That will serve both our customers and the environment.’ Ostling

UK has developed the largest market for low carbon buses in Europe based on certification

- ❑ UK created a supportive environment for the adoption of low carbon buses.
- ❑ Incentives:
 - Independent certification, lead by industry endorsed by Government
 - 6 p/km supplement available via Bus Service Operators Grant,
 - Capital grants, Green Bus Fund and Scottish Green Bus Funds
- ❑ Partnership working:
 - Manufacturers and operators monitoring low carbon buses and disseminated to bus industry
- ❑ Regulatory/de-regulatory approaches
 - Local Transport Act provides local transport authorities outside London greater role to work with bus operators










- Green Bus Fund and Scottish GBF will support:
- ❑ 33 bus operators
 - ❑ Purchase of 566 low carbon buses
 - ❑ Benefits UK manufacturers
 - ❑ Save 0.8MtCO2 by 2020



Using an appropriate metric for fuel efficiency

- ❑ Litres/100km is not a good fuel efficiency metric for commercial vehicles as it is only relevant for comparison between vehicles of similar duty cycles and size
- ❑ Metric based upon fuel used/work done is more relevant
- ❑ Work done can be expressed as tonnekm, cubicmetrekm or passengerkm.

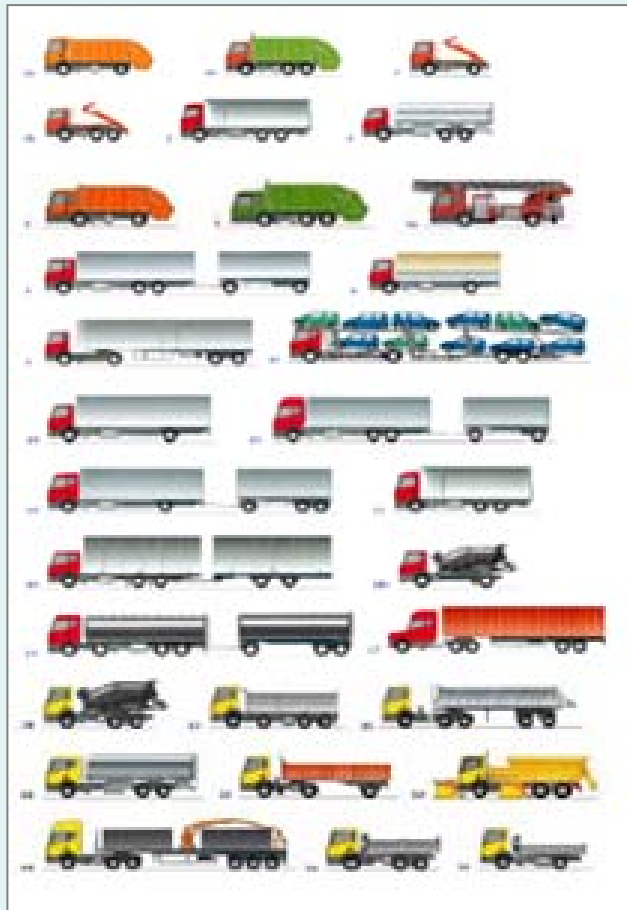
GCW/GVW* tonne	Load Capacity tonne	Distance km	tonnekm	l/1000tonnekm at 100% utilisation	normal utilisation	l/1000tonnekm considering normal utilisation
LONG DISTANCE						
26 	17	100	1700	14.7	70%	21.0
40 	25	100	2500	12.8	70%	18.3
60 	40	100	4000	10.8	70%	15.4
URBAN DISTRIBUTION						
3.5 	1.5	100	150	80.0	45%	177.8
7.5 	4	100	400	37.5	45%	83.3
12 	7.2	100	720	26.4	45%	58.6
18 	11	100	1100	20.0	45%	44.4

SOURCE VOLVO

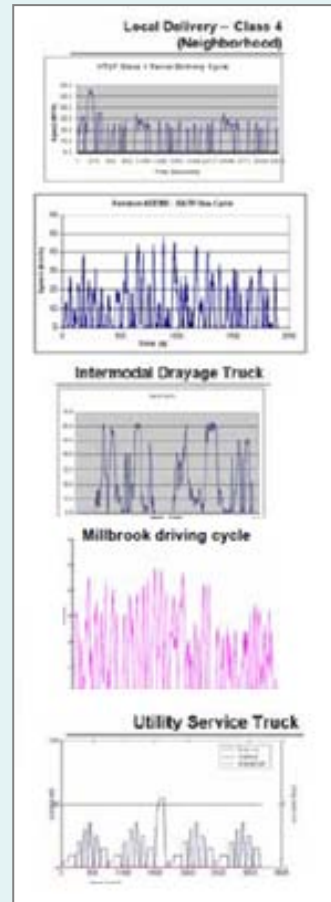
*Gross Combination Weight (Long Distance) / Gross Vehicle Weight (Urban Distribution)

There is a huge variety of HDV variants performing unique missions and duty cycles









Huge variety of vehicles



Unique duties



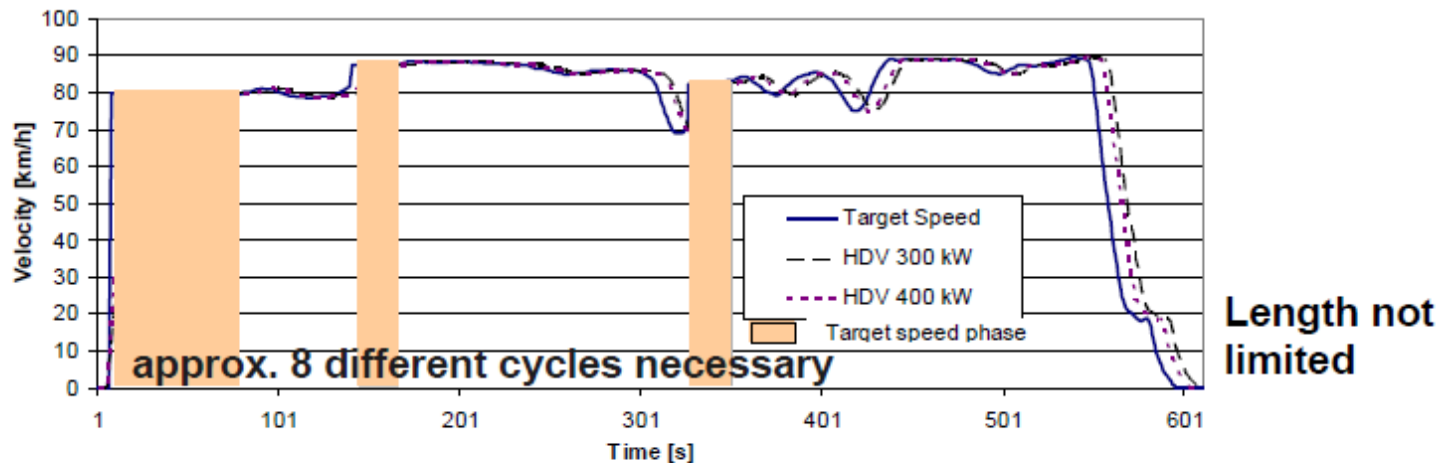
Missions & duty cycles

City delivery		1
Delivery / communal		2
Heavy delivery		3
Long haul		4
One Overnight		5
On-road construction		6
Heavy construction		7
City Bus		8

Ideally test cycle should reflect real world conditions as closely as possible.

Driving conditions very different between vehicle categories and mission profiles. **Options:**

- a) One representative cycle per vehicle category (and mission profile) eventually including target speed phases and road gradients
+ one short standard cycle verifiable with PEMS or on chassis dyno



- b) WHVC with different weighting factors for urban, road, motorway
Disadvantages: no target speed phases, no road gradients
→ may be unfair for several future technologies
Advantages: simpler, compatible with engine test approach

Computer simulation is the preferred option as the basis for certification



	Repeat-ability	Effort	Capable of all systems	Sensi-tivity	Incentive for optimisations
chassis dyno & driving resist.	+	--	+	0	+
on-road testing (PEMS)	--	--	++	--	0
Simulation tool & driving resist. & other test data	++	++	-	+ (1)	+ (1)

(1) Depends on details of the approach

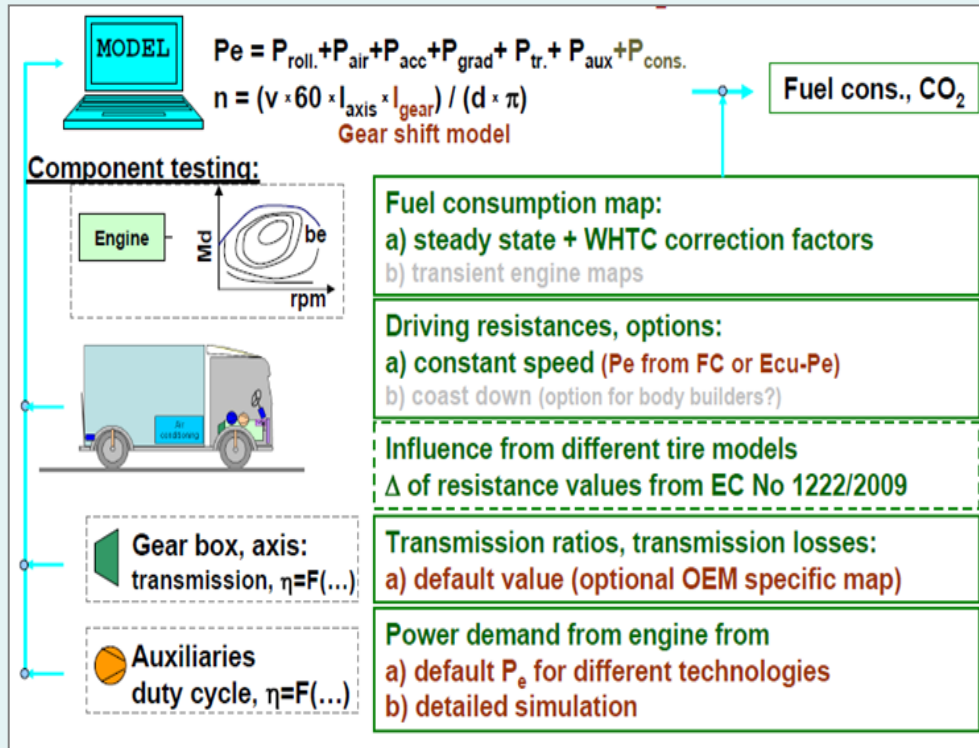


Due to manifold combinations of engine, transmission, cabin, body etc. each manufacturer would have to test hundreds of models



Certification procedure shall include all relevant vehicle components

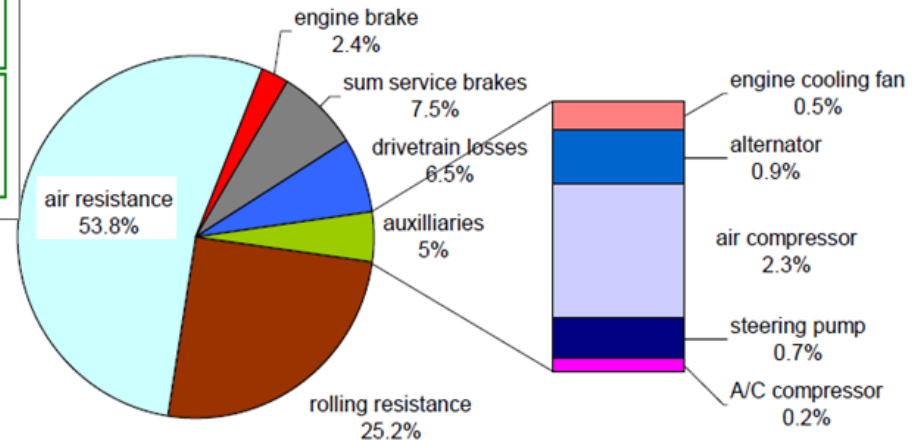
Proposed approach to simulation tool and its limitations



- ❑ Target date for implementation in Europe 2013.
- ❑ Simulation tool requires testing with manufacturers in 2012.
- ❑ A driver model and trailer specification to be defined.
- ❑ Extent of elements incorporated into simulation to be confirmed.

Shares in energy consumption

Example: EURO V semitrailer with total 28 t, highway driving



Accuracy of simulation tool is an issue, likely to need to be supplemented by physical test for main variants in product range.

→ **Must be included:**
 *** Air resistance
 *** Rolling resistance
 *** Engine efficiency
 → +transmission ratios

Shall be included:
 ** Transmission losses

May be included:
 * Auxiliaries
 * Power consumers
(Auxiliaries are more important for buses!)

Summary

- ❑ Europe is unlikely to regulate CO2 for HDVs in the manner it has for cars and LCVs. However there is a strong case for certification and incentives.
- ❑ The need to minimise the cost of testing as part of a CO2 certification scheme will in the use a simulation tool in conjunction with component testing as part of a certification process.
- ❑ Absolute accuracy of simulation tools is likely to require benchmarking against dyno or road tests for a limited number of variants.
- ❑ During type approval an additional engine test will be required to provide a standardised engine fuel map.
- ❑ Standardised bodies and trailers will need to be defined for the purposes of certification along with a driver module.
- ❑ The extent to which auxiliaries will be incorporated is still in question.
- ❑ Ideally a fully representative test cycle will be developed to include gradients and target speed phases.
- ❑ Original target of rolling out certification scheme in 2013 is likely to be challenging.

Thank You!

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